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Polytechnic Club of the American Institute.

Meeting held at the rooms of the Association, Dec. 22, 1870. Prof. S. D. TILLMAN in the chair.

Mr. KROM exhibited specimens of materials of nearly equal specific gravity separated from each other by his machine. He had long since succeeded in separating zinc blende from galena with facility, their specific gravities being 4.0 and 7.05. He had now succeeded in separating spathic iron from cryolite, their specific gravities being 2.9 and 3.9. The difference of specific gravity of diamonds and sand is greater than this, diamonds being 3.5 and sand 1.8, quartz sand being 2.6. Other precious stones, as topaz, sapphire, ruby, have a specific gravity of about 4.0. The gravel might be passed through the machine at the rate of 8 or 10 tons per day, and the precious stones would be separated. The apparatus by which this is effected contains a pair of bellows, moving about an inch and giving about 450 currents a minute. With water you can get but 120 of these intermittent currents in a minute, and the separation of zinc and lead is all that it can accomplish.

COMPRESSED AIR.

The consideration of the subject of the transmission of power by means of compressed air, was resumed.

The President (Prof. S. D. TILLMAN) regarded the subject as the most important that had come before the Association for a long time, the use of compressed air being undoubtedly destined to work a revolution in the arts.

Mr. HORACE H. DAY stated results of his experiments at Bloomingdale, N. J., assisted by Mr. HENSON, a mechanical and consulting engineer, during the last summer. No one could long be engaged in such experiments without discovering the absolute necessity of employing some means to absorb or overcome the heat evolved in the condensation of the air. The means he had employed was injecting a small steady stream or spray of water into the air in the cylinder which is undergoing compression. Another point, long overlooked, is the necessity of closing up the end of the pipe in the first place. For the want of this simple precaution, as stated by the President on the last evening, many of the early experiments had failed. Gen. SERRELL, who has been for two years engaged in the construction of the Hoosac tunnel in Massachusetts, where compressed air is employed, states that he was associated with Prof. MORSE at the time that Prof. MORSE undertook to connect Washington and Baltimore by a lead pipe, but that after they had carried the pipe two miles from Washington they had failed to get force enough in the pipe to blow out a candle. Had Prof. MORSE closed up the end of the pipe until the pressure had accumulated through the whole length of the pipe, he would then have found the force of the air nearly as great, two miles from Washington, as where the air was put into the pipe, and that force could have been maintained by pumping in the air as fast as it was used up at the other end. These are the A B C's of the question; but, simple as they are, it has cost much trouble and expense to arrive at them. The theory that the whole force of the air is passing like a piston rod, rubbing against the sides of the cylinders, cannot be true, but it must be that the air rolls upon itself, the pressure being lateral as well as longitudinal, the friction being ascertained to be so small as to surprise all who have investigated the subject. We in America, who have such a vast measure of water power, may well thank France and Italy for the benefits to be derived from the Mount Cenis tunnel, not so much by its facilitating intercommunication between Northern Europe and the Mediterranean, as by its successful demonstration of the fact that power can be transmitted through long distances with but little loss by friction, and thus, by the inauguration of a new era in the mechanical world, we have already followed the example of Italy and France. Massachusetts, through its Legislature, after obtaining a report from a commission presided over by Prof. STORROW, upon the system of tunneling employed at Mount Cenis, has adopted the same system—the application of compressed air in its tunneling of the Hoosac mountain; and where Massachusetts leads, in a matter of dollars and cents, it is safe for New York to follow. Time will prove that this is the best motor ever given to the world, and that the loss of power in its use is the least. Every one admits that there is a great loss by friction even in the best turbine wheel, and in conveying its power to the point where it can be used. Now we shall undoubtedly be able to learn much hereafter with regard to the economical use of compressed air; but I venture to prophesy that, in the present state of the art, we shall be found to utilize at least 75 per cent. of the power, using it at a distance of two miles from the fall from which we derive our power. All writers on this subject agree that there is a loss by heat evolved in condensation. This is a question, then, inviting our best efforts to devise instrumentalities by which that heat may be saved. Cheap transportation is one of the blessings of the world, and when we can bring the power of Niagara and other falls to the work of tunneling and preparing the way for railway or canal intercommunication, we shall be able to connect, as never before, the waters of New York city with the waters of the great lakes of the West. Another great work needs this aid—the construction of the great canal to connect the Atlantic with the Pacific. We must not stand idle and let other cities take the lead. Already at New Orleans and at Chicago compressed air is in use for propelling street cars.

Mr. J. K. FISHER read an extract from Dr. BARNARD's report, read at the last meeting, in relation to the loss of heat. Here is the dilemma in which we appear to be placed: If we work at low pressure, there is a comparatively great loss by friction; and if we work at a high pressure, there is a comparatively great loss of heat from condensation.

Mr. HYDE described the atmospheric railway, invented by an American, and constructed in the neighborhood of London, about the year 1840. They attained a speed of thirty-six miles an hour with a train of cars. Yet they failed, from two causes. At intervals they had engines both for exhaust and for pressure; and it was found that the exhausting engine was more important than the other, for the moment they began to exhaust the atmospheric pressure at the other end began to operate. A trouble arose from the latent heat of the air. Mr. JAMES NASMYTH instituted a series of experiments. He bought from the government dock-yard at Woolwich a hydraulic pump, which he took to Manchester and set to work. One day he put a pressure of sixty atmospheres upon it, and the next morning it had gone down to six. At first he thought the pump leaked; but from subsequent experiments became convinced that the pressure passed through the iron in the shape of heat. Coal is gold; in other words, steam is gold. The steam that works the pumps that compress the air is gold. When the air is compressed by steam it costs too much; that's what's the matter. But what do the waters that tumble down Niagara Falls cost? If those waters can be in any degree availed of for the purpose of compressing air, we have but to do our best to insulate the receivers to prevent the heat from passing through; and that I think is the great secret of this problem.

Mr. HORACE H. DAY said that the subject of the loss of power by its oozing through metals in the form of heat, was rather a theoretical question for the laboratory than a practical question; and he cited the report of the experiments at the Mont Cenis tunnel, showing the loss to be too small to be necessarily taken into account. On one occasion they left the air compressed in the pipes for twenty-four days, and during that time the loss was but 1-160th part of a day's supply. The question of the use of compressed air goes farther than furnishing power for elevators or machine shops. It furnishes means of additional convenience and comfort in the private house. It furnishes improved means for light and cooking, for ventilation of a sick room, for cooling the house in warm weather, and will be found useful in numerous other ways when engineering skill and invention shall be brought to bear upon this subject.

Mr. HYDE—Put in proportion to the augmentation of pressure, there is a loss from the heat evolved in the condensation and passing through the medium that confines the air. Where the pressure costs so little, as in the plan submitted by Mr. DAY, this loss has no commercial value. But if you have to create, by expensive mechanical power, the compression of the air, in order to obtain a valuable mechanical equivalent afterwards, there is a loss which must be taken into the account.

Mr. CHARLES B. BOYLE cited the facts asserted by Sir CHAS. LYELL, that the South American glaciers come 23° nearer the equator on the south than on the north, attributing the difference to evaporation, as a reason for presuming that there would be less loss from cooling when the compressed air is employed, as proposed by Mr. DAY.

Dr. BOYNTON—Suppose the air in a cylinder to be compressed to one-half its volume, by pressing down the piston half way, what is the temperature of that condensed air?

The PRESIDENT—480° is the increase of temperature.

Dr. BOYNTON—At Niagara Falls you have a power which has been running to waste for 48,000 years; and you use a small part of that power to compress air in a cylinder. Fresh air is all the time pressed in behind it; and I ask if it is not cooling in the pipe all the way to Buffalo. And when the air is taken from the pipe at Buffalo to drive machinery, the air in expanding absorbs from the atmosphere a quantity of heat exactly equal to the quantity radiated when it was compressed. Visiting the East River bridge caisson to-day, I found the temperature outside a little below 30°. In the caisson I found the temperature to be about 72°. Upon coming up into the lock, at my request, they let the air out very slowly into the open atmosphere, allowing the air to expand to double its volume. The diminution of temperature from expanding two atmospheres from one was just 20°, for the thermometer fell to 52°. Now, if you compress the air in a cylinder to one-half its volume, its temperature is increased just 20°. If you add another charge, will it go any lower? I do not believe it will. I believe it will continue 20° higher in the cylinder than in the tube. I do not think it is necessary to take the loss of heat in the compression into account at all, unless you are going to use the power where the air is compressed. All power is from the sun. The power of coal comes from the action of the sunlight upon the leaf of the plants in the age when the coal was deposited. The power in Niagara Falls is just equivalent to the power of the sun-light which evaporated the water from the ocean and carried it up to the great lakes, from which it rushes over Niagara Falls. If we were to heat the air at Buffalo by these 20° its expansive force would be increased; but it is unnecessary to do that.

Mr. C. EDWARDS LESTER—The statement that so much power has been wasted for 48,000 years at Niagara Falls suggested to me the calculation how much is wasting every day at Hell-gate. It turns out that we have more water-power wasted here than at Niagara Falls. That power is 16,000 times as great as that from all the coal burned upon the island to-day. There is more water-power in the rivers of every State in the Union than is used by the whole United States. To make use of the tidal power would give us the equivalent of a coal mine in the middle of Hell-gate. The power of the tide running to waste upon the coast of the United States is 4,000 billion times as great as the whole mechanical world is using to-day. We cannot much longer afford to incur the monstrous expense of coal. There is no necessity for it. Coal will cease to be of value to us when we learn to make use of the mightier power in the water and in the air, the only two materials God has given us enough of without our taxing our ingenuity and toiling in constant labor to make up the deficit.

The PRESIDENT stated that at about the same time when Mr. STEVENS, of Hoboken began to apply air to the bottom of a boat to diminish friction, he had himself independently experimented in the same direction. In the year 1842 he made a cylinder and attached it to a boat, on Seneca lake, so that by working the piston the air should be forced under the boat and propel it while diminishing the friction. He tried the experiment, and went across the river at a pretty good speed, but was inclined to think a pair of oars would have been of more service. The difficulty was that the air was not compressed, and it is necessary that the air should be compressed in order to use it to advantage. In some places the use of compressed air would be entirely futile, and in others of great importance. At the Mont Cenis and the Hoosac tunnels its value is demonstrated. Mr. DAY has purchased the lower fall at Rochester. It is perfectly feasible to transfer that power to the city of Rochester. Nobody pretends that he would get the full amount of the power. If he can get seventy-five per cent. of it, that is worth a million dollars a year. With regard to taking to Buffalo the power of Niagara Falls, I have always thought there ought to be use for it at Niagara Falls; but if there is not, it can be taken to Buffalo. So far as we can use the water power now useless, we shall economize in coal.

Mr. HYDE described a mode employed in the West for obtaining power from the force of currents of freely running water.

Mr. W. S. HENSON—In regard to the loss of heat, if we pump heat into the receiver along with the air, of course that heat will radiate and be lost. But you will find it recorded that in the operations at Bardoneche, the Italians lay still for five or six weeks, and only lost about as much air as they could pump in in a quarter of a minute. I think that is a sufficient answer to the suggestion of loss while the receivers are standing still, for in that case they were under pressure the whole time.

Mr. DAY—I have figured up the cost at Rochester, for the land, the power, the pipes, and all the apparatus, and I cannot make it reach $40,000, including the expense of managing the company. I was told, a few days ago, that the cost o running a millstone at Rochester, requiring twelve and a half horse power, is $1000 per annum, making a cost of $80 per horse power. When I say that I can carry the power from the lower fall, and make as big dividends as the railroads when fairly conducted ordinarily make for $12.50 per annum for each horse power, I think it will show that this is not only good in theory but has money in it.

Dr. BOYNTON—There is one point that strikes my mind with regard to working compressed air expansively, as you would steam. Now if we take a cylinder and divide it into seven parts, corresponding to a pressure of seven atmospheres, (the pressure at Niagara being about six atmospheres) then the air in one of these divisions will expand to fill the whole cylinder. I do not think you will have a loss of seven times 20°, but only a loss of 20°.

Mr. FISHER—I do not deny the economy of Mr. DAY's system

in using a power which is running to waste, for if we were to realize one-fourth of the power it would be a profitable thing.

The PRESIDENT announced the continuation of this subject at the next meeting.

Adjourned until January 12, 1871.

Tunnel to Lake Bigler, California.

ACCORDING to the Auburn *Stars and Stripes*, VON SCHMIDT & Co. will commence a tunnel for tapping Lake Bigler within a month or six weeks. The tunnel will be commenced at the head of Squaw Valley, where the distance through the mountain will be about three miles. The time necessary to complete the tunnel is estimated at twenty months. The project has been talked of for years, and there is no doubt of its being feasible—the only question is, will it pay? One thing in its favor is, that the supply would be perpetual and ample. The flow of one hundred thousand inches from the lake to this side of the Sierras would make scarcely any perceptible difference in its height.

On the Sewage Question.

A Paper read before the Glasgow Philosophical Society (Sanitary Section), Nov. 9th, 1870, by EDWARD C. C. STANFORD, F. C, S.

I HAVE been requested by the Committee of the Sanitary Section of the Philosophical Society to remind the Section of the origin of its existence; and, after the great variety of excellent papers read in this Section last year, it is, perhaps, as well to remember that we grew out of the Sewage Association of Glasgow, and that the subject which that Association met to discuss is still, even more than it was then, one of the most important, and the most interesting, as it confessedly is also still the most difficult problem of the day.

I have much pleasure in recording our early labors, because they were not without an important result. After a great number of discussions, where every possible variety of opinion was expressed, and where most of us commenced with the usual strong prejudice in favor of sewage by water carriage, we actually did pass unanimously, at the close of the session in 1868, the following resolution, first in committee, and then in open meeting:

"That, in the course of the discussions which have taken place at the Association's meetings, sufficient evidence has been produced to warrant them in recommending the authorities, before coming to any conclusion on the subject of the sewage, and purification of the river, to make experiments on the practicability of such schemes as proceed on the principle of providing that fœcal matters must no longer be allowed to enter the common sewers or the river."

Again, I find in the minutes of a meeting in this Section on the 28th December, 1869, in the discussion on Dr. GREY's paper advocating a system of water carriage, that—"The Section expressed disapproval of that mode, and affirmed to the finding of the Sewage Association on the subject."

I remind the Section of these resolutions, because I consider them real marks of progress, and because they show that we have had the courage to pause and seek other solutions of the difficulty than that one idea constantly thrust upon us by high engineering authorities, which sounds very like the cry of "Water, water everywhere, but not a drop to drink."

The present year has been marked by the appearance of two authoritative reports—the "Report of the Rivers' Pollution Royal Commission," and the Report of the British Association Committee "On the Treatment and Utilisation of Sewage," which has appeared in a volume by Professor W. N. CORFIELD. Of the Report of the Royal Commission, I feel bound to say that it is the most valuable and comprehensive which has yet appeared; the innumerable analyses of water and sewage testify to the completeness of the inquiry; and show that Dr. FRANKLAND has taken up the subject with his usual accuracy and breadth of view. The nature of the inquiry, that of the pollution of rivers, has, however, naturally led the Royal Commissioners to look at our town refuse at the large, and, therefore, in my opinion, the wrong end, and to try to stem the tide of contagion after it has become a river, rather than to deal with the pollution at its source. Irrigation, then, as a necessary consequence, will probably be duly enforced as the compulsory result of a compulsory water-closet.

Of the Report of the British Association Committee, I cannot, however, speak so favorably. This committee was appointed in 1868, and a short but valuable statistical report from it was read at Exeter in the following year. It was then reappointed, with a grant of £50 from the Association, and several new members added. The committee then took the unprecedented course of applying to cities and towns to contribute to their funds in sums proportioned to the number of inhabitants; they thus raised about £1,500, of which I understand about £500 have been expended. Several gentlemen representing towns who had thus subscribed, indignantly asked, at Liverpool, what had been done with their money; and Prof. CORFIELD's book, since published, was their promised solace. The actual report will not appear till the publication of the "Proceedings of the British Association" for 1870, but this work is published under the authority of the committee, and pretends to be a synopsis of its views. There appears, however, to have been some strong dissension, amongst the committee, for one of their number—in fact, the reporter of the former year—at one of the Liverpool meetings, expressly denied all complicity in the report of this year. The committee underwent so severe a handling in two sections where the report was read, that they withdrew it from a third, where it was also to have appeared. My impression certainly is that they would have been more severely handled if Professor CORFIELD's work had been then published as the principal result of their labors. This work is a *re-chauffée* of the Report of the Royal Commission, in which the facts of the original are not improved on by the opinions of the author.

Corporations and town councils who have subscribed to th British Association Committee will, no doubt, be gratified to learn that they can purchase this interesting volume for 7s. 6d., and read in abstract what has been already published *in extenso* in a Government blue-book, well illustrated with plans, maps, and engravings, 5s. Some who have subscribed largely may not object to a balance-sheet in the next edition.

The committee were charged at Liverpool with a strong prejudice in favor of water carriage and irrigation; and certainly no one can read this work without seeing at once that its purpose is directly to enunciate these views. One remarkable part of this report, however, is that it advocates the use of a separate system of sewers for house sewage, or of settling or filtering the sewage before employment for irrigation. Now the former is an extraordinary admission for sanitary engineers to make; it shows the correctness of our views, and concedes the real point of our demands. We have always been told that a double set of sewers would entirely upset our existing system, and that it never could be carried out. Among others, Dr. ANDERSON, in his report, states it to be impossible. Having now admitted this necessity, the whole question is reversed, and I maintain that the step is in the right direction; and the next consideration (which ought to have been the first) should be to really carefully examine the best methods of dealing with house refuse. This, I maintain, has never been fully, fairly and systematically done. In neither of the reports now referred to has sufficient justice been done, or sufficient attention been paid, to any system of removal of excreta, other than by water carriage.

LIEURNUR's pneumatic system is not alluded to at all in the Rivers' Pollution Report, and dismissed in a few words without evidence in the other. The charcoal method of removal, though brought forward at the British Association at Exeter, and before some of the committee, is alluded to in neither. Nor is the remarkable deterioration of lead pipes, when attached to water-closets, mentioned, although the evidence has never been contradicted. The ingenious method of distillation of sewage proposed by Mr. CHAPMAN is also unnoticed. Mr. HOEY's method of saving water in the ordinary closets is not spoken of. WEARE's method of sewage filtration through charcoal and ashes is not once referred to. Now these processes may not have come under the notice of the Royal Commission; but I maintain that, whatever their value, they ought to have been thoroughly examined by the British Association Committee, who define the term "sewage" as applying "to all refuse of human habitations affecting the health of the country."

In a paper read before you two years ago, I reduced the methods of removal to three—so-called water, air and earth carriage, and, under these, described how each method should be carried out and tested. I wish now briefly to repeat my views, that you may see how far they were right by those two new lights which have since dawned on us. If water carriage be continued, then it should be conducted by a separate system of cast-iron pipes, which could be easily flushed, and in which gases could not accumulate. If air carriage, then LIEURNUR's pneumatic system ought to be thoroughly tested. I showed how economically the fœcal matter could be forced from the reservoirs, by a small compressing air-pump, out to a chemical work at any distance, where it could be easily dealt with. If the LIEURNUR process gives out any odor, this must be modified by the use of a little powdered charcoal, which could be easily applied by WEARE's pepper-box dry-closet lid. If earth carriage be preferred, as I think it eventually will be, then I advised its being re-carbonized until it assumes the form of X charcoal—that is, being re-burned until it represents the charcoal obtained from the excreta. As to ordinary sewage, I gave it as my opinion that no process could ever be devised that would extract from it, chemically, its manurial value. No evidence since has shaken that opinion; and all must agree with Dr. FRANKLAND in his sweeping condemnation of the A B C and other processes of this kind, although I remember our Corporation would not believe in any of us when we tried to prove their absurdity. I stated then, too, that intermittent filtration and irrigation were the only means of purifying sewage. These opinions are fully corroborated by the Rivers' Commission Report. I strongly recommended charcoal for this filtration—by preference, seaweed or X charcoal, and exhibited specimens of sewage thus purified, specimens now again before you in actual *statu quo*. The purification is perfect, but I held out no hopes that more than the suspended matters would be retained. I am induced to allude again more particularly to this filtration, because Messrs. WEARE's system has since been introduced to the notice of our authorities. WEARE's process is a method of filtration through ashes and charcoal; by the kindness of Mr. JOHNSON, I am enabled to show you some plans of this method. There can be no doubt of the purification effected; of course, the available nitrogen cannot be separated from the sewage, but the patentees appear to separate sufficient manurial value to make the process pay and produce a saleable manure; and, therefore, even to precede irrigation, it would be a valuable adjunct. The specimens you see before you for the second time are those of thick pure sewage from the bottom of the sewage-well at Worthing, and of Glasgow sewage before and after filtration through seaweed charcoal. The Glasgow sewage contains a good deal of iron, and is not now offensive; but the other is a pure house-sewage—and any one removing the stopper, and inserting his nose, will believe at once that four years' standing, including some months in the Paris Exhibition, has in no way impaired its character as a choice essence of epidemics; nor has it effected the purity of the filtered water.

I append analyses of the sewage before and after treatment:

	Grains in Gallon. Stanford.		Anderson.	
	1.	2.	3.	4.
Solution, organic	24·80	24·00	52·80	8·72
" inorganic	72 80	56·60	2.6·56	124·80
Suspension, organic	23·20	19·60	169.76	
" inorganic	15·20	14·80		
Total	136·00	115·00	449·12	133.52
Total organic matter	48·00	43.60		
" inorganic "	88·00	71·40		
Total	136·00	115·00		

1. Glasgow, March, 1868; sewer, north side, north-east corner of Jamaica bridge.

2. Glasgow, March, 1868; sewer, south side, below Jamaica bridge.

3. Concentrated WORTHING sewage; bottom of well.

4. Concentrated WORTHING sewage; after filtration of seaweed charcoal.

The WORTHING sewage is a severe test, as it contains four or five times the quantity of solid matter found in ordinary sewage; but the purification is perfect to all appearance. I did not find, however, that the charcoal had retained much of the nitrogen.

The phospho-carbon manure made by WEARE & Co. sells at 80s. per ton at the works; and the effluent water from the filters is no doubt efficiently oxidised. The process, as a modified method of charcoal fibration, is well worth a full and searching inquiry.

I think all will agree with me that the water-closet system, if connected with a separate system of pipes, and the sewage subjected to intermittent filtration through charcoal, and then used for irrigation where convenient, or run away when it cannot be so used, would be very much safer than at present. With a modified amount of water something might be done with it; but it is questionable whether even then it would pay for the outlay. Both filtration and irrigation must fail if the storm-waters are still allowed to mix with the sewage, as a sudden storm of rain will upset all the arrangements. The Rivers' Pollution Commissioners, however, appear determined to treat the whole refuse of towns with rainfall in the main sewers; and irrigation is, consequently, with them the only remedy, as such a large quantity of water cannot be filtered. Let us, therefore, in view of their certain recommendation to adopt irrigation for Glasgow, look further into this; and here I borrow a table from Mr. W. R. W. SMITH:

Minimum sewage, per day. Gallons.	Tons.	Maximum sewage, per day. Gallons.	Tons.	Sewage in twenty years, per day. Gallons.	Tons.	Area. Grass.	Cereals.
35,000,000	156,250	57,000,000	254,464	82,000,000	365,983	10,000 acres. / 15 sq. miles.	51,800 acres. / 75 sq. miles.
						16,000 acres. / 25 sq. miles.	84,000 acres. / 125 sq. miles.
						23,500 acres. / 35 sq. miles.	121,400 acres. / 180 sq. miles.

It is based on Messrs. BATEMAN and BAZALGETTE's report, from the experience of Mr. MORTON, on the Lodge Farm, at 5,400 tons per annum of sewage per acre of grass, and at 1,100 tons per annum of sewage per acre of cereals; from which it will be seen that, if cereals are to be largely cultivated, the corporation will require in twenty years a small farm of 121,400 acres, or 180 square miles, for cereals, unless they can sell the grass of thirty-five square miles; either would make a considerable demand on the county of Ayrshire.

We shall await with much interest Dr. FRANKLAND's report of the capability of purification of sewage possessed by the Irvine sand, and also the analyses of the Glasgow sewage. Dr. ANDERSON's report showed it to possess some remarkable peculiarities, with a general strength two-thirds that of London. Now the difference is due to the increased rainfall; but, as this rainfall has again to be encountered by the sewage *in situ* on the farm, it ought to be double the strength of that of London, to have an equal chance of success, and this even if the temperature were equally warm and the atmosphere equally dry. But it does not pay in London, and how can we expect it to do so here?

Some instances are given in the Report of Her Majesty's Commission of Sewage Farms, from which I take the highest return per head per annum; in no case do I find any profits shown. The Lodge Farm experience is said to represent a return of five shillings per head of the population.

In a former paper I said: "Irrigation, the only method of utilising sewage, puts an amount of money value on the ground out of all proportion to the return obtained by the rate-payers. There appears no doubt that the farmer will not give one halfpenny per ton for it, delivered free of expense. Where gravitation and open carriers can be employed without pumping, its application is remunerative; but in no case is anything like the full money value obtained to the rate-payer. The cost of transport, where the chemical value of a product is only one penny per ton, is far the more important item." Mr. HOPE, of the Lodge Farm, the most prominent advocate of irrigation, has never disproved these assertions.

Professor CORFIELD says that the British Associat ion om

mittee will accept no scheme which does not make it pay." Now, 5,400 tons of sewage at one penny per ton for grass land is equal to a top dressing of £22 10s. per acre, that is, its minimum value. Where is the West of Scotland farmer that would dream of using this manure at its market price?

[TO BE CONTINUED.]

Phosphates in Agriculture.

From a Paper read before the Natural History Society of Montreal, November, 1870, by GORDON BROOME, F. G. S., of the Geological Survey of Canada.

APATITE, although of some importance to the manufacturer of the element phosphorous, and in the preparation of certain varieties of porcelain, derives its chief interest from its power, when used in conjunction with nitrogenous substances, of restoring exhausted lands to their original fertility, and of increasing the value, for agricultural purposes, of such as have always have been, more or less, sterile and unproductive.

Phosphoric acid is an essential element of all but the lowest animal structures; and the large quantities of phosphate of lime found in the chitinous tests of Lingula, as well as in the shields of the Trilobitidæ, prove that the element phosphorous possessed, from the earliest geological epochs, the same importance, in its relation to the animal kingdom, as at the present day; and, since the sole source of the phosphorous in animal organisms is from the vegetable kingdom, it is not surprising to find that the element is equally essential to the higher order of plants, and, more especially to those which are most adapted to the wants of animals.

The following table, extracted partly from the works of S. W. JOHNSON, and in part derived from EMMONS' Report, on the geology of North Carolina, exhibits this relation in a very striking manner, and proves, moreover, that not only the most nutritious plants, but also the most valuable portions of the same species contain the highest percentages of phosphoric acid:

TABLE I.—PHOSPHORIC ACID IN THE ASHES OF PLANTS.

Series A—Edible Substances.

	P. O.5 per cent.		P. O.5 per cent.
Rice	53	Rice straw	1
Rye	50	Rye straw	4
Wheat	50	Wheat straw	3
Maize	45	Maize straw	17
Oats	44	Oat straw	3
Barley	39	Barley straw	3
Beans	38	Bean straw	7
Peas	33	Pease straw	5
Turnips	13	Turnip tops	9
Potatoes	13	Potato tops	8
Clover	18	Beet root	8
Cabbage	12	Meadow grass	8

Series B—Miscellaneous Substances.

	P. O.5 per cent.		P. O.5 per cent.
1 Leaves of Catawaba Grape	18.3	7 Fibre of Flax	6.2
2 White Oak (Quercus Alba) Twigs	12.7	Seaweed (average)	0.28
3 Do. do Wood	4.5	AUTHORITIES: Series I. JOHNSON.	
4 Cotton (wool of)	11.6	Series II. 1.6 inch. EMMONS.	
5 Tobacco	6.5	7. WAY.	

The phosphorous of plants appears, for the most part, to be confined to the softer and more highly organized portions of the structure; there is but little to answer to the lime and magnesia phosphates constituting the main frame-work of the hard internal skeleton of vertebrata, or to those composing the exoskeleton of crustacea and lower orders. The phosphorus of a plant would seem to correspond more closely to that of the more nervous and vascular animal tissues; as, for example, to that of the brain in man, which amounts to 0.9 per cent. of the cerebric acid, or of the albumin and fibrin of the blood.

The following Table (II), which might be greatly amplified, has been compiled for the sake of comparison:—

TABLE II.

PHOSPHORUS IN ANIMAL SUBSTANCES.

Ox Bone	12.25—Fremy.
Human Bone	9.21—Richardson.*
Lingula ovalis (shell—recent sp.)	17.16—Sterry Hunt.†
Mastodon (fossil bone)	17.13—Pratt.‡
Casein	1.42—Mülder.
Urine (human)	1.24—BerIelius.
Cerebric Acid (human brain)	0.90—Fremy.
Milk (of cow)	0.68—Haidlen.
Fibrin (of blood)	0.58—Fownes.
Albumin (of blood)	0.40—Mülder.
Gastric Juice, Saliva, Mucous, etc., etc.,	Traces—Fownes.

From the researches of chemists and physiologists it is now fully established that the element phosphorus plays a most important part in the performance of nerve functions; that it undergoes many, at present, inexplicable changes within the bodies of vertebrate animals; and that various of its oxy-compounds, produced by such changes, as well as the phosphates resulting from the waste of the bones, are constantly rejected from the system in a soluble condition.

There is, therefore, in the history of the element phosphorous, a beautiful example of a complete circle of changes; and of a number of substances existing, at one time or another, in each of the three great divisions of nature, and handed on, from the world of vegetable existence to that of animal life, before being finally returned to inorganic nature, thenceforth to be subjected to a number of chemical changes, preparing them for a new round of usefulness. But, in order to enable this great principle to operate completely and effectually, one thing is necessary; for, owing to the concentration of populations in towns and cities, one link, so to speak, in the chain, becomes faulty, and the return of phosphates to the soil must be aided by artificial means.

From whatever lands vegetable matters are removed in the annual crops, there is a constant withdrawal of the necessary mineral constituents of the plant, including, of course, the phosphoric acid; and, although poor or exhausted lands do not shew the entire absence of phosphates, yet they have become deficient in such phosphorus salts as are available for the use of the growing plant; and do not, especially, contain enough to suffice for the cereals, containing, as they do, a larger proportion of phosphoric acid than any other family of plants.

The grain of wheat contains about 8-10ths per cent. of phosphoric acid. which proportion amounts to 16 lbs. of the acid to each ton (=2,000 lbs.) weight of wheat. Now the amount of phosphoric acid in soil may be said to average 0·2 per cent.; although, except in clays, the proportion is usually less. Taking 0·2 per cent. as the average quantity, and assuming the specific gravity of soil to be 2.5, there exists in the soil covering one acre of land, to the depth of 12 inches, about 68.6 lbs. of phosphoric acid; or only enough to supply the phosphates to 4.16 tons of wheat. The total weight of wheat (whether as grain or in the state of flour) exported from the port of Montreal, in 1869, amounted to about 292,534.5 tons;* or a weight requiring the total abstraction of phosphoric acid from 70,320.8 acres (=109.8 square miles) of good average land. This withdrawal of phosphoric acid, equalling 2,340 tons (392,534.5×16 =4,680,552 lbs. =2,340 tons) would require, in order to counterbalance the loss, the annual employment of 5,850 tons of apalite, containing 88 per cent. of phosphate of lime; a quantity equivalent to 6,864 tons of apatite of 75 per cent., or to 13,728 tons of "super-phosphates" of good quality.

* Chemical Technology, vol. ii., Article "Soluble Phosphates."

† First discovered by Dr. T. Sterry Hunt, who, in 1854, showed the shells of Lingula to have a composition identical with the bones of vertebrates. (Silliman's Journal [2], vol. xvii., p. 235.)

‡ Report South Carolina Phosphates, 1868. About 30 per cent. organic matter lost by decomposition, while the recent Lingula examined by Dr. Hunt had previously lost 38 per cent. of organic matter by calcination.

The Treasures of the Andes.

Says a writer in the Panama *Star and Herald:* When the cry was heard in Europe of the abundance of gold in America, the poor of all nations started up, careless of home and country, to partake of the sudden riches, whereas the reports of silver in Mexico and Peru, and diamonds in Brazil or Cape of Good Hope have excited but little emotion. Our latest advices from Chili bring us continued and excited accounts of the discoveries of rich mines of silver. The *Independent* of the 15th of October says: "More news has been received from the Molacca, a recently discovered mine of the Rosilla, and another a little more to the north. Crowds of people have gone from Chanarcilla, each one to prospect for himself. It was further reported that at Algarobba, south of Chanarcilla, vast deposits of silver and gold had been found deposited in the form of streets. In view of all this, it is recommended that the Government should appoint officers to regulate the supply of water and prevent disorders. "Two days after," continues this paper, "a correspondent wrote, 'Good news! great news! Caracoles beaten!'" In effect the mines found lately in Bolivia have found a rival in the Sapos, about ten or twelve leagues more to the south. Two miners who had been out prospecting arrived with specimens of a mine discovered by them, which gave two thousand marcos the box or *cajon*, which from virgin Cordilleras need not cause wonder or unbelief, and might well give rise to a second Chanarcilla. In a vein worked by JACINTO TORRES two hundred and fifty pounds of the ore gave forty-eight marcos of silver. In consequence of all this there are some five hundred persons on the spot, some looking on, some prospecting. There is great enthusiasm, and a feeling of rivalry to beat the lately discovered rich mines in Bolivia. Impatient enthusiasts are recommended patience, and told that, furnished with this virtue and aided by saliva, an ant might be able to swallow an elephant. This practical proverb is recommended to dissatisfied workmen and mechanics who wish to abandon the certain for chance speculation.

Various fortunate speculators had returned in the steamer. The locality is good and abundant room for all. The worst of it is that food is not easily obtained and only at high prices. Water is bad in quality and produces a peculiar disease, by which the sufferers are afflicted with a sort of fungus tumors under the skin called *clavos* or warts, which extend rapidly and are accompanied by the most atrocious pains throughout the body. Like the ancients, who placed dragons, serpents and other supernatural beings to guard the treasures of the earth from those who sought to get suddenly rich, we have natural obstacles to overcome if we wish to obtain the silver from the mines of Caracoles. However, instead of envying, with our arms crossed, the luck of our Chilean and Bolivian friends, have we not also the spurs and Cordilleras belonging to the same great Andean system of mountains? We know where the mines of Cana are and what they produced. To partake of the riches of the kingdom of nature, we must do as we are told how to do to enter the kingdom of Heaven. "Seek and you shall find."

Lower Wages in our Mines.

The *Alta California* is quoted as saying:—Out of the twenty mines on the Comstock Lode, only two are paying dividends; of the underground miners, only one in five is a source of profit to his employers. The bulk of the yield of the Comstock Lode goes into the pockets of the laborers, and the owners get only about one dollar of ten taken from the mines. If they want to go on giving more for the labor than it is worth to them, of course they have the privilege. If they should pay the same wages to their miners as are paid to the farm laborers of California, they would save $2,000,000 annually; they would be able to give employment to many more men, and they would enable the owners of a hundred mines, in California as well as Nevada, to commence work with a profit in mines that are, and will remain closed, because the labor necessary to open and work them costs far more than other labor requiring equal skill and intelligence commands in the market. Four dollars a day, gold, is more than mines that do not pay expenses can afford. Washoe is the chief centre of quartz mining on the coast; it employs more men and produces more bullion than any other mining district on the Pacific slope, and the rate of wages there adopted serves to a considerable extent as a standard for Idaho, Oregon, Utah, California and Arizona, as well as for Nevada.

* This information was kindly furnished by Wm. T. Patterson, Esq., Secretary to the Montreal Board of Trade.

Iodine and Bromine for the Detection of Gold in Minute Quantities.

By W. SKEY, Analyst to the Geological Survey of New Zealand.

THE large number of non-auriferous, or but slightly auriferous, specimens of quartz and pyritous rocks, which have lately been submitted here for examination for gold, has rendered it very desirable that some quicker, less laborious, and, if possible, more exhaustive method of analysis, than the current one (that by amalgamation), should be employed. In recognition of this I have frequently been urged by the director of this department to attempt some other process, and after several preliminary experiments I turned my attention especially to the use of iodine or bromine for this object.

Both of these substances differ from chlorine, especially in their relative feeble affinities for hydrogen, so there would be less to fear, that from the generation of hydra-acids, any great preponderance of other matters would be dissolved along with the gold we wish to separate from the sample under examination. Iodine, indeed, has already been used with advantage in the analysis of certain meteorites, for the separation of the iron and nickel existing therein in a metallic state; these it combines with, leaving the associated silicates, iron-oxides and sulphides intact. It was this comportment of iodine with other substances that determined me to the trial of both it and bromine for the purposes named.

The results of my experiments certainly show that either of these agents may be safely and advantageously employed for the separation of gold from its matrices. The following are the particulars of a few of these experiments, which besides their present use will, I think, be useful in showing what is, approximately, the smallest quantity of gold that can be positively separated and identified, by a certain course of analysis operating upon a limited quantity—the first time, I believe, anything of this kind has been attempted.

1st. Two grammes of roasted "buddle headings" from a quartz mine at the Thames, known from previous analysis to contain gold at the rate of one ounce or so to the ton, was well shaken for a little while with its volume of alcoholic solution of iodine (tincture of iodine of chemists), then allowed to subside. A piece of Swedish filter-paper was then saturated with the clear supernatant liquid, and afterwards burned to an ash; the ash, in the place of being white, as it would be if pure, was colored purple; the coloring matter was quickly removed by bromine—a clear indication of the presence of gold. The time occupied by the whole process was twenty minutes.

2d. One gramme of the same "buddle headings," mixed with such a quantity of soil as to reduce the proportion of gold present to 2 dwts. per ton, was allowed contact with its volume of the tincture for two hours, with occasional stirring; a piece of filter-paper was then saturated with the tincture, and dried, five times consecutively, and finally burned off as before; in this case, also, the color of the residual ash was purple, and it gave the reaction of gold.

3d. Thirty-two grammes of siliceous hematite, finely-pounded, was thoroughly mixed with precipitated gold to the amount of 2 dwts. per ton, then ignited, and treated with bromine water. After two hours the solution was filtered, and evaporated to a bulk of 20 minims; this gave a good reaction of gold to the "chloride of tin" test.

4th. One hundred grammes of the hematite, with precipitated gold at the rate of ½ dwt. per ton, treated as before, but this time well washed, at the expiration of the two hours, and the washings evaporated along with the first filtrate, gave a fainter, but still decided, reaction of gold to the same test.

5th. Iodine, as tincture, substituted for bromine in experiments 3 and 4, gave similar results; the only variation made was, that as a precautionary measure allowing for its feebler, or rather slower action, I gave contact for twelve hours.

To compare the results of the common amalgamating process with the foregoing, I have made some careful experiments; and I find that it is not certain, with the same expenditure of labor, to get reliable indications of gold, when present in less quantity than 2 dwts. per ton, operating upon about 100 grammes of material, which is about the quantity I usually take. In summing up the results of these experiments, it appears, then, that for qualitative determinations in certain cases, iodine and bromine are each superior to mercury. It also appears that a proportion of gold equal to ½ dwt. per ton, upon a bulk of 103 grammes (about 4 ounces) of ferruginous matters, can be easily and rapidly detected. Of course, by operating upon larger quantities, gold could be discovered by this process, were it present in far less quantities, but this is sufficiently near for the majority of cases.

These processes are especially adapted for the separation of gold from sulphides, as the preliminary roasting is extremely favorable to them, not so much chemically as mechanically, I think; the loss in the substitution of oxygen for sulphur, amounting to 25 per cent., by weight, while the volume remains constant (or nearly so); hence there is a corresponding porosity in the product, by which it is certain every atom of it is thrown open to contact with the solution of these agents. This mechanical accessibility obviously cannot be taken advantage of by mercury. With sulphides these processes are practically exhaustive, while, at the same time, the simultaneous extraction of other matters is avoided, or, at any rate, is so trifling, that the proper tests for gold can be safely applied directly to the concentrated solution. Regarding the choice between iodine and bromine, I would prefer the former, when mere traces of gold are supposed to be present; or if the

ore is in a finely divided state, as is generally the case when the matrix is iron pyrites.

In the roasting of such pyrites it is necessary to raise the temperature towards the end to a full red-heat, in order to decompose the ferruginous sulphates, since if these remained, much iron would get into the solution. In the case of much carbonate of lime being present, it is proper to gently re-ignite the roasted mineral, etc., with carbonate of ammonia, or much lime might get into the iodine or bromine solution. On the other hand, a very high temperature is to be avoided, for, from my own experience, I find a considerable quantity of fine gold can escape detection in this way, by the partial vitrification of the more fusible of the silicates. The identification of gold by the combustion of its salts with filter-paper, as suggested in this paper, seems to promise a rapid method of estimating it, comparatively, by the aid of a series of prepared test-papers, representing gold in different degrees of dilution.—*Chemical News.*

The Speculation in Quicksilver.

THE price of quicksilver has been again advanced ten cents per pound, making the present price 90 cents, a higher figure than has been reached for many years. As much has been said and written concerning the recent advances, the monopoly of the article, both here and in Europe, and the present status of the several California mines, it will be worth while to give a little history of the speculations and combinations in quicksilver for some years past, which will afford some insight as to the manner in which "big things" are put up for the benefit of a few speculators at the expense of the great industries of the country.

For some years prior to 1868, the supply of quicksilver had been largely in excess of the demand, and the price here had been kept up only by the leading speculators—Messrs. BARRON and MILLS—having contracted for the entire product of the new Almaden mine for two years, with a limit of 50,000 flasks, at $30 per flask, and also by purchasing the entire product of the Redington and the New Idria mines, the yield of these two being at that time but about 4,000 flasks per annum each. In April, 1868, the contracting parties, finding that the production was largely increasing, while the demand remained about the same, declined making any further contract for purchasing, and after considerable negotiation, a combination was finally arranged between the new Almaden, represented by S. F. BUTTERWORTH, the New Idria, controlled by BARRON & MILLS, and the Redington mine, owned by REDINGTON & LIVERMORE, for two years. The New Almaden, which claimed to have a capacity for delivering 4,000 flasks per month, agreed to limit their production to 24,000 per annum, and the Redington and New Idria, each of which claimed a capacity of 1,500 flasks per month, agreed to limit their product to 10,000 flasks per annum each. BARRON & Co., under the contract, were to be the shipping and foreign agents, and REDINGTON & Co. were to have the exclusive local sale. The price to consumers in the Pacific States was fixed at 60 cents per pound, or $45 90 per flask; while the product sent abroad, being the much larger portion, sold for from $20 to $40 per flask; the average of home and foreign sales netting to the combination about $35 per flask. The product of all the mines fell considerably short of anticipation, the New Almaden delivering but about 18,000 per annum, the New Idria about 8,000, and the Redington 7,000.

In the early part of 1870, we find by the annual report of the New Almaden Company, published in New York, that they were in a very bad financial position, a judgment of $55,000 in gold having to be immediately paid; and in addition, there was a large amount due the Bank of California, payment of which was imperatively demanded. In this emergency, their managing agent in San Francisco, S. F. BUTTERWORTH, was authorized to make some financial arrangement to relieve their pressing need, and that gentleman, in pursuance of the object, entered into a contract with D. O. MILLS, by which all quicksilver belonging to the New Almaden in foreign markets (about 20,000 flasks) was sold for $32 per flask, and the entire product of the mine for two years up to April 1st, 1870 (with a limit of 2,000 flasks per month), sold for $31 per flask.

Upon the expiration of the combination between the New Almaden, the New Idria, and the Redington mines, the owners of the last named company, knowing that the New Almaden and New Idria were controlled by the same parties, declined either to enter into a new combination or to contract to sell their product at anything like the price paid for the New Almaden; but after considerable negotiation, finally entered into a contract with BARRON & MILLS to sell their entire product for ten years. The price was not made public, but it was generally understood that they received $40 per flask, and agreed to limit their product to the same amount as in the previous combination, 10,000 flasks per annum. The great falling off in the product of the New Almaden, which almost immediately declined to less than 1,000 flasks per month, and the subsequent lease of the Spanish mine to the Rothschilds, who advanced the price in London £2 per flask, has enabled the holders here to advance the price until it has now reached 90 cents per pound, or $68 85 per flask, and the owners of the Redington mine who, under their contract, still hold exclusive control of the local sale, now have the satisfaction of delivering the quicksilver to BARRON & MILLS at $40 per flask, and reselling it under their orders for $68 86. Strangely enough, the product of their mine, which started off at the full limit, has, at the price increased, gradually dwindled down to about 300 flasks per month, and, although it is well known that they have recently opened new and large veins of rich ore in their mine, they are now, it is said, running but one furnace, and, it is intimated, may even be obliged by "circumstances over which they have no control" to suspend operations entirely.

There are several other mines of small capacity now being worked—the Pope Valley mine, near Napa, and one or two in Lake county, near the Redington mine—all of which may be made to pay at the present high price of quicksilver, and it is to be hoped that they will yet be worked up to a product which will end the monopoly that is now damaging the interests of the coast to an extent only realized by those who are concerned in mining operations. The future outlook, which is not a flattering one for consumers, may be summed up about as follows: The Spanish mines are under lease to the ROTHSCHILDS, who will control the foreign market; the New Almaden, which formerly produced as high as 4,000 flasks per month, has fallen to less than 1,000, and, it is said by those best informed, will be likely to decline considerably from that figure.

The New Idria, besides being involved in litigation which may compel its stopping, has also fallen off greatly in its yield, and the product of the Redington mine is purposely kept at a low figure, because its owners prefer to keep their ore in the mine rather than deliver it at the price agreed upon under a contract which only compels them to deliver what they manufacture. The only chance for a reduction in the price is in the increase of product from new mines, or from the smaller mines now being worked, and it is to be hoped that the attention of capitalists may be turned to this subject. It is lamentable that an article so indispensable in lode mining, and even in a great part of our deep gravel operations, should be pushed to an extreme price by speculative combinations, which necessarily depress, to some extent, a leading industry of the State, and greatly diminish the profits of those who continue to prosecute it.—*San Francisco Evening Bulletin.*

The Oldest Known Fossil Remains.

THERE has been received at the Geological Museum of the General Land Office, Washington, D. C., a greenish colored limestone containing *Eozöon Canadense*, a forminiferous creature of microscopic dimensions, which lived in communities and built up its stony receptacles in the ocean, in a manner analogous to the corals of the present time. The limestone owes its coloring to an admixture of Serpentine, and when properly shaded or blended is classed among the Verd antique marbles. The specimens in question came from a railroad cutting on the Adirondac and Lake George Railroad, about twenty-five miles from Saratoga, near Thurman Station, Warren county, New York, and therefore from the most southerly portion of the Adirondac Mountains, thus giving us not only a new locality of *Eozöon*, but one of great extent. By treating with chlorohydric acid the structure can be developed beautifully in these specimens received.

Naturalists and geologists may congratulate themselves in having a source of this curious fossil within a moderate distance, where specimens are abundant, as the whole mottled serpentine marble deposit, is found to be one mass of *Eozöon Canadense.*

This fossil owes its distinction to the fact that it is found only in a class of rocks, which, from their low position in the geological scale, had always been regarded as azoic, or not enclosing any evidences of organic life, at the time when they were deposited, and as belonging to an age previous to the appearance of life upon the globe.

It was first made known to the scientific world by Sir WM. LOGAN, the director of the Canada Geological Survey, in 1858, at a meeting of the American Association of Science, held at Springfield, Mass. It was first discovered by Mr. J. MCCULLOCH, on the Grand Calumet Island, in the river Ottawa, and has been obtained from many other localities since in different parts of the Laurentian mountains, in Canada, and the Adirondacs, in the United States.

Several zones of limestone are found in these ranges, consisting of alternate layers of calcareous rocks and a magnesian silicate of serpentine aspect, which was seen filling up the interspaces of the fossil, rather than replacing it, as is common in petrifactions. Specimens of the stone were sliced and polished for examination under the microscope by Principal DAWSON, of the Montreal University, who found it to consist of clusters of a sessile organism, which had grown up by increasing at the surface by the addition of successive layers of chambers separated by calcareous laminæ. The interior of these spaces exhibited bunches of firmly branching tubuli. By aggregation of individuals it acquired an enormous size, and assumed the aspect of a coralline reef. Dr. DAWSON assigned it a place among the Foraminifera, and his conclusion have been affirmed by the researches of Prof. CARPENTER, the eminent microscopist of London. Its place in creation is far down in the scale below the Silurian rocks, and is only found in the lowest series of the Laurentian formation, and therefore millions of years before the lingulæ and fucoids, once regarded as the oldest inhabitants of the rocks. A. R. ROESSLER.

Geological Rooms, U. S. General Land Office, Dec. 20, 1870.

Kansas and Colorado Coals.

MR. JAMES T. HODGE writes that he has been making a special survey and numerous analyses of the Rocky Mountain coals. "I call them coals," he writes, "rather than lignites; for such they are, both in appearance and quality, though in general they contain from 10 to 15 per cent. of water. Except in this and in their geological position, (in the Miocene Tertiary) they bear no resemblance to the 'brown coals.' They are a brilliant jet black—powder black; specific gravity 1.32 to 1.33, while the brown coals range, according to KARSTEN, from 1.20 to 1.29; ash, in general, from 3.50 to 5.00 per cent.; but in two instances I found 1.73 and 2.00 only; and these coals made in the crucible *coke* of a fair quality. The thickness of one of these beds is twenty-six feet! In general they are remarkably free from pyrites, and the slate is rarely injurious to any great extent.

"It is wonderful that over so vast an area, extending from the eastern base of the Black Hill through Wyoming to Utah, these beds of tertiary coals should present a striking uniformity of composition, the differences observed not to be compared with those noticed in neighboring beds in our Appalachian Coal Measures, and utterly dissimilar in this respect to the very variable characters of the brown coals of the Rhine and other coal districts of Europe. They prove of great value for the locomotives of the railroads and for domestic purposes, and those that will make a sound coke—of which I formerly supposed there were none—will be valuable for metallurgical purposes."

MINING SUMMARY.

California

SOME FACTS ABOUT THE NEW IDRIA MINING CLAIM.

The MCGARRAHAN claim has excited so much attention of late, that the following facts in relation to it, forwarded by the San Francisco *Bulletin*, will be read with interest:

"When the New Idria Mining Company located their mining claim in 1854, the exterior boundary of the grant known as the Panoche Grande did not reach within twelve miles of the claim. On the 26th day of July, 1866, Congress passed an act declaring that the mineral lands of the United States, both surveyed and unsurveyed, were open to exploration and occupation by all citizens, subject to such regulations as might be prescribed by law, and to the local customs and rules of mines. The act also provides that any person or association might, after expending $1,000 in labor and improvements on the lode, file a diagram of the same in the local land office, and receive a patent therefor, etc. The New Idria Mining Company had, when this law took effect, already expended $150,000 on their mine. The company then complied with every provision of the act of 1866, and actually paid over to the Recorder of the local land office $5 per acre for the amount of land included in the diagram, together with the costs of survey, and received the usual certificate. The survey and plans were transmitted to the General Land Office, from which, in their usual order of business, a patent should have been issued without any protracted delay. The company took precisely the same steps to obtain their patent as did the leading mining companies of Nevada—such as the Chollar, Gould & Curry, Savage, and other companies had taken without any hindrance, and with complete success. In the winter of 1867-8, MCGARRAHAN, and those working in his interest, obtained the introduction of a bill, giving him the right to purchase seventeen thousand acres of land of the United States, at $1 25 an acre. This step was not taken until the Gomez title, under which he had claimed, had been tainted with fraud, and defeated in the Federal Courts. MCGARRAHAN proposed to buy this land of the United States, acknowledging that there was no other title. But he did not propose to buy until the rights of the New Idria Mining Company had become perfect under the mining act. Congress, by its own act, had made another disposition of 480 acres of land which contained the New Idria cinnebar lode. MCGARRAHAN'S bill was defeated in the Senate, after being thoroughly investigated by the Committee on Private Land Claims. MCGARRAHAN and his backers have introduced this bill again in the Lower House, and FORNEY has begun to champion the claim. There will be another fight over the claim in Congress, for there is money in it, as we have seen by a proposition to give one man $20,000 for his influence with a high official in favor of the claim as presented by MCGARRAHAN. No decision has been made adverse to the New Idria Mining Company, except to suspend further examination of the case before the Land, and to refer the whole case again to Cougress.

GOLD AND SILVER NEAR SAN FRANCISCO.

The San Francisco *Scientific Press* says: "On Sansol creek, the head-waters of Fruit Vale creek, about three and a half miles from Brooklyn and thirteen miles from San Francisco, Mr. ALBERT ELDRED is energetically driving a tunnel, which is already in over eighty feet. A large vein of rock containing sulphurets has been struck, and we are assured that assays of this rock, and of rock from neighboring veins, have afforded satisfactory results. Mr. ELDRED has some 400 acres of land in his ranch, on which the works are located. He has already over a ton of selected ore on the dump, which is to be brought to this city and treated. Although not over-sanguine as to the existence of rich gold and silver fields at our doors, yet we shall be interested to hear of the results obtained. Mr. ELDRED is certainly working away with a will. Mr. GEO. MAY, we are told, is at work on a ledge, a mile or so from Mr. ELDRED'S place, across the hills, and is taking steps for the immediate erection of a quartz mill. We should advise him strongly to develop his ledge before he puts his money into a mill."

Lower California.

SAN RAFAEL MINES.

San Diego *Union* of December 1st learns that the placers hardly average $1 per day to the hand. The quartz is rich, but the Mexicans drive off the Americans. The *Union's* informant pounded out three ounces of gold from fifty pounds of rock, with a hammer. While he was at work, the Recorder of the district, a Mexican, came along and observed the richness of the discovery. The next day he was informed that it had been registered by other parties. On returning to his claim he was driven off by a party of twelve to fifteen Mexicans.

Montana.

FROM SNOW-SHOE GULCH.

"We learn from Mr. WM. HARPER, of Cedar Creek," says the Missoula *Pioneer*, Dec. 15, "who passed through Missoula a few days since, that good diggings have been struck in Snow-shoe Gulch, on claims Nos. 2 and 3 above discovery. He says that on these claims it is fully forty feet to the bed-rock, and that the owners are taking out as high as from $1 to $2 to the pan from the gravel. The gold is coarse and heavy, closely resembling that found in the claims at Forest City. Mr. HARPER, who intends to return here next spring, is the owner of two of the richest claims on Cedar Creek, and he gives it as his opinion that this section will prove to be the richest mining ground in the Territory when spring fairly opens."

QUARTZ MINING.

The *Independent* has, from Mr. John Thompson, of Soap Gulch, the following particulars of mining matters east of the range:—"Messrs. THOMPSON & DICKEY have taken out 700 tons of very rich galena ore, all of which has been purchased by persons owning furnaces. Their ledge is about three feet wide, and has every indication of being a true fissure vein. They have followed the ledge a distance of 125 feet without the quality or quantity of the ore materially changing. WM. SPARR & Co. have also taken out about fifteen tons of rich galena ore from a ledge in the same locality. Messrs. PARKS & DICKEY, on Moose creek, are running their arastra on rock from the Dixie ledge. It pays an average of $35 per ton. Their

arastra is housed in, and the owners think they will be enabled to crush ore all winter. The capacity of their reduction works is one ton per day, and the mine yields about two tons of pay ore per day. Messrs. DAY & HARVEY are taking out a considerable quantity of ore daily, all of which is very rich. Their reduction works are not now in operation, and will not be until spring. There is not now a doubt that they have the best silver mines in Montana. Messrs. H. D. MANSFIELD, FRANK BECK and others, are preparing to develop the mines of Vipond District. There is every reason to believe that these mines are both rich and permanent, but as yet sufficient developments have not been made to justify a positive opinion of their merits.

Utah.

The Salt Lake *Herald* of December 6th says: "Colonel D. E. BUEL is erecting smelting-works on Bingham Canyon, having purchased a half interest in the Botsford property. He has only commenced the erection of one furnace, with a capacity of fifteen tons a day; but the mine is sufficiently developed to show that four of equal capacity could be supplied from it alone. The smelting-works at the mouth of Cottonwood are rapidly progressing towards completion.

Michigan.

THE LAKE SUPERIOR COPPER MINES.

The Marquette *Journal* says that the copper mines are mostly being worked on the tribute system. The National and Minnesota are doing fairly. The Clark, Copper Harbor and Central are working their usual force, with favorable results. The mines have all sent forward their available copper. At the Copper Falls, a man named T. R. JOB was instantly killed by a premature explosion.

The Portage Lake *Mining Gazette* says that the grand total production of ingot copper for the year past, from the copper mines of Lake Superior, will not be far from 12,000 tons. Of this the Hecla, Calumet, Quincy, Franklin and Pewabic have shipped the largest amounts.

COAL FIELDS.

Geological surveys, says a contemporary, show the fact that a coal basin or formation underlies a large portion of the territory known as the Saginaw district. The coal was found within six feet of the surface, and the bed is supposed to extend for miles. The point where the coal was found is about three miles from Owosso, near the Detroit and Milwaukee Railroad. H. P. GILBERT and H. R. GILBERT constitute the company, known as the Briar Hill Iron and Coal Company.

Colorado.

COLORADO MANUFACTORIES—THE GOLDEN CITY MINERAL AND LAND COMPANY'S WORKS.

A recent visit to the Golden Pottery and Fire Brick Works, under the efficient management of M. C. KIRBY, Esq., superintendent and business manager of the Golden City Mineral and Land Company, has elicited a good deal of useful and surprising information as to the amount of manufacturing involved in the extensive works of the above company. The following statistics of what has been done in 1869-1870, and up to December 1st, 1870, shows well for its management, and that the opening up of new mines and new railways in Colorado has given all its branches of industry a new impetus within the last thirteen months. Mr. KIRBY has constructed and added to the works and the coal mine the following additions: A new engine and hoisting apparatus sufficient to raise forty tons of coal per day; a new engine-house 20x30; a good brick-yard for manufacturing common brick; a new coal-shaft on north side of Vasquez Fork, seventy-five feet deep, where the coal vein has been struck seven to twelve feet wide.

We will now proceed to give all necessary items to illustrate the several articles of pottery, fire-brick, calcined and uncalcined fire-clay, silica, coal and building brick produced by this establishment in '62 and '70.

POTTERY

is made here of innumerable kinds, and is put into every shape demanded for industrial or economical uses, jars, churns, spittoons, chamber-ware, pitchers, water-coolers, flower-pots, terra-cotta arches, muffles, crucibles, scorifiers, tiles and drainage tiles, are among the more common productions. The number of gallons of ware manufactured in '69 and '70 is 20,062. Number of gallons sold during that time was 12,062, and averaging 20 cents per gallon.

FIRE-BRICK.

Number of fire-brick manufactured in '69 and '70, 50,960. Number of fire-brick sold during that time, 50,960, and average price per thousand, $125. Fire-brick are largely used at Black Hawk, Central and Georgetown.

COMMON BUILDING BRICK.

Number of brick manufactured in '69 and '70 was 282,000; average price $10 per thousand. Some of the best buildings in town were constructed from this yard, such as the School of Mines, Osborne's cottage, Jarvis Hall, West & Kelly's printing office and drug store, Richards' cottage, etc.

COAL.

The coal mines reopened and thoroughly prospected, and its accessories improved and arranged by Mr. KIRBY, have turned out, since December 1st, '69, a large quantity of excellent coal. Amount of coal raised from December 1st, '69, to December 1st, '70, 1,432½ tons, of which 685 tons were raised since October 1st, 1870. Mr. KIRBY has lately turned over to the Hazleton Coal Mining Company the whole of the deposit belonging to the Golden City Mineral and Land Company. A large force are at work preparing two new shafts in addition to those already opened by Mr. KIRBY. This will enable them to turn out in January, 1871, about 200 tons per day. We were told by the late manager of the coal mine that his pump, as now rigged in the first shaft, is amply sufficient to pump all the small amount of water which runs into it daily. No trouble is now experienced from any excessive flow of water, even at the depth mining is now done, nor does it appear at all likely until he gets far below the bed of Clear Creek, which is 181 feet below the mouth of the hoisting-shaft. The new shaft just started by the Hazleton Coal Company lies adjoining the C. C. Railroad completed line, about seven-eighths of a mile west of town. The quality of coal is excellent, and improves as the vein is penetrated deeper. Everything indicates a prosperous year for the enterprising lessees of the mine, while to the Golden City Mineral and Land Company it gives more time and more attention to bestow upon developing the vast treasure of fire and potter's clay, brick clay and silica found upon their rich property.

FIRE CLAY.

Fire clay, both raw from the mine or calcined, is of great use at all the smelting and reducing works in the mountain mining region. During the past year there has been sold and sent off 200 tons: average price per ton, $7.

SILICA.

An excellent bed of a very fine quality of pure white sand is found west of the coal vein. As tested, it makes a fine glass, and for cleaning or polishing for brass or steel it is found to answer admirably. The new company intend to send some off, and test its capacity for the arts.

Bog ore and lime-stone also abound on the land of the Golden City Mineral and Land Company, and will yet be of singular value to work and use for iron manufactory, combined with magnetic ore.

RICH DISCOVERY IN GRAND ISLAND.

According to the Colorado *Herald* of the 10th ult., a rich vein of ore has been struck in the Ohio lode. The appearance of this mine improves steadily as a greater depth is reached. Like most lodes in Grand Island district, it only wants development to prove the value of the rich deposits beneath. BAKER has evidently struck a good thing in this lode. A new and exceedingly rich thirty-inch vein of sulphurets has been struck in the Cariboo mine, 140 feet west of the main shaft. Specimens of native silver, much resembling that obtained from the Coaley lode, are taken out in considerable quantities. This ore will yield, judging from assays, over $5,000 per ton. A spur northwest of the main shaft has been discovered, which is thought to be worth nearly $100,000 alone. A shaft has been sunk ten or fifteen feet. The crevice matter is partially composed of hard ore, worth about $100 per ton, and of decomposed material, the latter being very rich.

The Ship in the Colorado Desert.—Some time ago considerable interest was excited throughout the country by the discovery of a ship in the Colorado Desert. The great wonder was, how did it get there? We see by late California papers that it still continues to excite interest in San Francisco, particularly as an exploring party of four persons has just returned from a search after this wonder. As was the case with previous explorers, this party did not succeed in reaching the ship, but only managed to obtain a view of it through a field of glass. The leader of this party, who, it is stated, is a man of veracity and good sense, says that he found the ship about forty-five miles southwest of Des Palmos station and the Cavassone lake, precisely at the spot where it had been reported to be by the Indians and by travellers. The party had travelled five days and four nights on thirty-six gallons of water for four men and five animals, and was forced to return without succeeding in the object of the exploration. The leader of the party, however, pushed on before his companions, travelling all night on foot, and tormented with a raging thirst, and only went far enough to assure himself that the ship actually existed. He says that he saw the ship distinctly through his glass, about a mile and a half distant. The ship appears to be 250 feet long, and lies on her beam-ends, with the bow, bowsprit and stern well above the sand. This indefatigable explorer has started out again for the fossil ship, taking with him several barrels of water, and planks to cross the soft mud of Cavassone lake. The most plausable theory advanced yet about the ship is, that, a long time ago, some enterprising parties endeavored to transport it across the desert on wheels, but abandoned the attempt when about midway.

Idaho.

MINING ITEMS.

The *Avalanche*, Dec. 3, says:—Last week Golden Chariot stock was dealt in to a considerable extent, and at improved figures. It opened at $62 in the San Francisco Stock and Exchange Board last Saturday, advanced to $68, receded to $66½, and finally closed at $70½. The November account of bullion receipts up to that date aggregated $34,624 88. The mine looks better than ever. At the bottom of the sixth level, between the south winze and the shaft, the vein is nowhere less than three feet wide. The ore from the fifth level is now being hoisted through the Elmore shaft. The machinery for the new hoisting works arrived this week. It is very powerful and of the most approved pattern. Both the Owyhee and Ida Elmore mills are now kept busy crushing Charlot ore. Under the administration of Superintendent CASSELL, the Chariot is proving an immense success. Mr. W. H. CLARK has completed his contract for sinking the Ida Elmore shaft fifty feet. A contract to sink an additional fifty feet will probably be let immediately. Last Saturday the stock was selling at $12. Superintendent PHEBY is busily engaged in fixing up the Mahogany for winter working. The Web-foot mill is running on Mahogany ore. We understand that the Cosmos mill will, in a short time, start up on Oro Fino ore, large quantities of which will soon be taken from the mine. Another batch of Red Mountain ore has recently been worked at the Cosmos mill, yielding very satisfactory returns. The Red Mountain has this season paid all the expenses of working, besides leaving a nice margin for extra operations. Besides the mines above mentioned, the Peck & Porter, Skookum, Chipmunk, Illinois Central, Belle Peck, Potosi, and perhaps others, will be worked this winter. In two months hence, if an unusually hard winter should not retard operations, there will not be mills and arrastrars enough in camp to work the ore that will be taken out.

New Mexico.

The *Press and Telegraph*, Nov. 5th, says:—Gulch mining has ended in this vicinity. Some few parties are drifting. In lead mining there is a fair showing. The Chester company are sinking a shaft and tunneling. Messrs. CONLY & Co. have commenced work again on the Atlantic lode, near Last Chance. The Aztec mill, on Ute creek, is reported paying dividends. The Chester, on Humbug Gulch, will start up in a few weeks. The Montezuma, on Ute creek, is yet idle. There is little prospecting going on, on account of the Grant question. Through WM. UESNER we are enabled to verify the statement of Mr. WHITEHILL, in our issue of the 15th, in regard to the silver lode discovered in Chloride District, in Grant county, by ISAAC STEVENS. From 35 dwts. of the ore, Mr. UESNER returned to us 9 dwts. and 18 grs. of silver, which would net $6,000 to the ton. A correspondent writes from Silver City:—Our great want is a good stamp mill, and whoever has the enterprise to bring the first one in, will be certain of a fortune, as there is rock enough already mined to run 40 stamps one year at least. It is the opinion of experienced men who have visited our district that it is as rich as Nevada.

THE RALSTON SILVER MINES.

The last Santa Fé (New Mexico) *Post* received by us has an article on the above-named mines, which were formerly known as the "Burro Mines." From this article, we learn that timber and water have been found in abundance near Ralston; that the place has about forty adobe houses, among which are a restaurant, dairy and boarding-house. Board was $15 per week. The Indians were quiet. No rows between whites had occurred, and the miners were in high spirits over their rich ores. We hope soon to hear of these mines being developed differently from the way the news papers have been developing them. They are in New Mexico, and that Territory ought certainly have some citizen or citizens wealthy enough and gritty enough to test Ralston with a mill.

MONTEZUMA MINE.

The Cimarron *News* of December 3d says: "We learn that it is the intention of the Maxwell Land Grant and Railroad Company to carry on with renewed vigor the works in connection with the Montezuma mine. The mill is estimated as being worth $30,000. There are already two shafts from sixty to eighty feet in depth, which, with the drifts from them, present proofs of enormous mineral wealth. The services of a scientific engineer from Europe have been engaged.

Nebraska.

The St. Louis *Democrat*, of Nov. 30th, says:—The people of Omaha, and at other places throughout Nebraska, have become very much interested in the subject of procuring, if possible, a home supply of coal. To the present time the mineralogical researches in this direction have failed to discover any outcroppings, or any subterraneous veins of sufficient thickness to pay for working. The State has therefore been forced to procure its fuel from the mines outside its boundaries. To further agitate the subject, an address was recently delivered before the Omaha Board of Trade by Dr. HAYDEN, geologist and mineralogist. He informed his audience that the coal of Nebraska is probably in the western rim of the great coal basin. By tracing the formation from surrounding States and Territories, it becomes apparent that in the vicinity of Omaha there can be no coal at any less depth than six or eight hundred feet. If a deposit were found at such a depth, and in a vein of sufficient thickness, it would pay for working. The speaker, in concluding his remarks, suggested the appropriation of six or seven thousand dollars by the city for settling the vexed question, as the result would be of the greatest importance to the residents and manufacturers in that vicinity.

Mexico.

A Santa Fé telegram of Nov. 28th is as follows:—A special correspondent of the *New Mexican*, of this city, says the people of Chihuahua are getting excited over a new discovery of placer gold diggings about seventy-five miles from that city. Don PEDRO GONZALES, the discoverer, with three other men, washed out twenty-three onnces of gold in nine hours. The pieces found are round lumps, ranging from the size of a grain of wheat to that of a hazel nut. One nugget weighed an ounce.

TREATING SILVER ORES.

Mr. E. B. SMITH, who has had charge for seven years of the Pittsburg and Sonora Mining Company, Mexico, has recently given the *Scientific Press* an account of the treatment of ores there by chlorination and lixiviation. We cull as follows:—The ore is first crushed under stamps. Crushing very fine has been found to give poor results, besides costing more than is necessary. If the ore is very fine the water filters through too slowly, and the process is more objectionable in several respects than when the rock is coarse. That passed through at No. 30 screens chlorinates as well as the finer, and filters better. Even this seems too fine at times, and a No. 24 screen is to be tried hereafter. The crushed ore is roasted with salt in a long reverberatory furnace with three hearths or floors, raised four inches higher than the next preceding, such as we some time ago described as in use by Mr. GRAFF at San Marcial. The roasted ore is cooled and dampened, so that it will "ball" in the hand. This causes it to swell and act better in the following process than if put in dry. It is then put, in charges of three tons, into tanks nine feet long, four and a half feet wide, and thirty inches deep, with the bottoms sloping to a point to facilitate the exit of all the liquid. There is a false bottom of slats, covered with coarse cotton sheeting, which serves as a filter. Water is now put into the tanks, and this dissolves the chlorides of the base metals, copper, lead, zinc, etc., without touching the chloride of silver. When a test shows that the base chlorides have been rewoved, a solution of hyposulphite of lime is added, in which the chloride of silver is soluble, until all the precious metal is removed. The solution is now led into precipitating tanks, where sulphide of calcium is added until all the silver is thrown down as a sulphide. In the meantime, this reaction changes the sulphide of calcium into hyposulphite of lime, which is used over in the leaching tanks. The silver sulphide is strained and pressed in canvas bags, and dried and roasted in a small reverberatory furnace. As some sulphur still remains, it is melted in crucibles with scrap iron, and now yields bullion from 900 to 950 fine.

Balloons for War Purposes.—The experiments made at Woolwich by ballons inflated at the Royal Arsenal Gas Works have, on the authority of the London *Artisan*, shown that a height of 100 fathoms at a horizontal distance of 600 fathoms from an enemy, would enable the observers to secure a wide expanse of view. The balloons with which experiments were made at Woolwich were held by two new cords fastened to the network, and terminated at two different points on the ground, to give greater stability to the balloon, and to provide against one cord snapping, or being cut by the enemy's fire. By the new system of military telegraphy for field service, and by means of wagons at present being placed in store in the Royal Arsenal, lines of telegraph can be carried through the air from the earth several miles distant. The wire can be paid out as fast as the balloon travels, so that if a captive balloon should break away, communication could be kept up with it for six miles; or two more balloons can be sent up, and kept in telegraphic communication with each other by means of similar lines, so that telegraphic operations can be made from the balloon to headquarters, and thence to th base of operations. By means of these new military telegraphi, appliances the most rapid intelligence, and consequent speedy word of command, can be given. In sieges war balloons are useful in giving information of depots, points of attack, batteries, inner intrenchments, the explosion of magazines in marshes, to spy out ambuscades that may be in waiting, to rally columns, and to telegraph points of assemby on attack. The observing officers were enabled to survey an area of thirty square miles. It was found that by practice great skill can be attained in judging of distances, and the relative position of masses of troops; while more minute details could be subsequently obtained at leisure by field glasses as to the position of mountain gorges, passes, limits of woods, and the course o streams. The trials hitherte made have been chiefly carried on by professional aeronauts with hired ballons; and it is believed that the British Government have at the present time no war balloons in store. The result of the observations of Captain BRACKENBURY and Captain NOBLE, sent out from Woolwich on behalf of the Government to the respective seats of war, together with trials and other sources of information, will, it is believed, result in war balloons being manufactured in the Royal Arsenal, and that officers of Roya Engineers, from generals downwads, will be trained in their use.

MARKET REVIEW.

The Coal Trade.

NEW YORK, Jan. 6, 1871.

WHOLESALE.—What there has been doing during the past week has been mostly for steamboat and city retailers. There is a fair supply of coal in the market; indeed, all that can be taken and keep up the present rates. Some of the dealers are under the impression that the general strike announced for the 10th inst. will not be thorough, that is, that all the miners will not join in it; but we hardly see how one section can break faith with the other and preserve the usefulness of the association. We therefore think the strike will be inaugurated at the time designated, and remain intact until the order is rescinded by the association. The price of coal depends very much upon whether the entire regions go out or not; and inasmuch as the market could get along very well with only a portion of the men working and rates be kept steady, those that did strike would have a very poor chance of making terms for a resumption of work.

The Lehigh Coal Exchange has fixed the following rates for January shipments at Elizabethport, Port Johnston and Hoboken: Lump, Broken and Egg, $5 50; Stove, $6 00: Chestnut, $5 00. Line prices remain unchanged.

The Delaware & Hudson Canal Company and Delaware & Lackawanna & Western Railroad Company have no coal for sale, and make no quotations this month. The Wilkesbarre Coal and Iron Company offer Lump, Broken and Egg, $6 00, Stove, $6 50, Chestnut, $5 50, on board at Hoboken. These rates are above the market, and we doubt very much if many sales are being made.

As is usual at this time of the year at the close of canal navigation, the railroad companies have advanced their freights, as will be seen by the following notice sent us:—

OFFICE LEHIGH VALLEY RAILROAD CO.

NOTICE TO SHIPPERS.

MAUCH CHUNK, Dec. 31, 1870.

On and after Monday, January 2d, 1871, the rate on "Through and Tide" Coal will be $2 22 per ton between Penn Haven and Port Johnston, which will be delivered:

Penn Haven to Mauch Chunk	$0 14
Mauch Chunk to Phillipsburgh	84
Phillipsburgh to Elizabethport	1 21
Phillipsburgh to Port Johnston	1 24
Phillipsburgh to Hoboken	1 36

NEWARK.

Mauch Chunk to Phillipsburgh	$0 84
Phillipsburgh to Newark	1 60

ASA PACKER, President.

CENTRAL RAILROAD OF NEW JERSEY,
General Office 119 Liberty street.
NEW YORK, Dec. 30, 1870.

NOTICE TO COAL SHIPPERS—NO. II.

On and after Monday, January 2d, 1871 Tolls on Coal shipments will be charged as follows, exclusive of wharfage and shipping expenses:

From Penn Haven to Phillipsburgh	$0 93
From Mauch Chunk to Phillipsburgh,	84
From Phillipsburgh to Elizabethport,	1 21
From Phillipsburgh to Port Johnston,	1 24
From Phillipsburgh to Newark	1 60
From Penn Haven to Port Johnston,	1 22

R. E. RICKER, Supt.

SAMUEL KNOX, Secretary.

The Morris & Essex Railroad have fixed their rates from Phillipsburgh to Port Johnston at $1 36, or 12 cents higher than the Central Railroad of New Jersey; the reason for this we can't understand, and there is much dissatisfaction expressed by the trade at their action.

RETAIL.—There is an active business doing; prices range from $6 50 to $7 50 for Pittston and Lehigh Coals, except for Lehigh Stove, which brings $8 00.

FREIGHTS.—Vessels are getting a little scarce, and rates are advancing.

Anthracite Coal Trade for 1869 and 1870.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending Dec. 31, 1870, compared with week ending Dec. 31, 1869.

COMPANIES.	1869. WEEK.	1869. TOTAL.	1870. WEEK.	1870. TOTAL.
Phila & Reading R.R.*	....	3,393,324	...	2,944,.63
Schuylkill Canal	....	675,764	...	542,466
Lehigh Valley R. R.	....	2,015,286	...	2,210,021
Lehigh & Sus. R. R.	22,095	923,969	29,604	1,120,360
Lehigh Canal	....	804,2.8	....	789,079
Scranton North	12,453	45,.172	1,828	693,813
" South	27,6.0	1,110,815	395	1,67.,.68
Penn. Coal Co., rail	14,2.3	947,.80	109	1,089,4 6
" " " canal	....	18,709	...	16,602
Del. & Hud. Canal Co.	...	1,2.6,2 0	...	1,292,.75
" " R. R.	10,911	180,.84	12,234	451,234
" " south	1,2.2	123,599	7,.06	430,562
By Jefferson R. R.	....	....	....	14,.77
Shamokin	5,130	474,524	1,918	496,174
Trevorton	....	36,8.8	....	3.,8 8
Lykens Valley Coal Co.	....	78 .85	....	156,360
Wyoming South	....	384,706	....	3.6,645
Wyoming North	....	76,306	....	19,465
P. N. Y. C. & R. R. Co.	....	....	....	27.,151
Williamstown, Co'y	668	201,017	2,626	266,425
Short Mountain	105	104 661	....	...
Total	94,370	13,030,440	55,700	15,53.,250
1869	55,700			13,030,440
Increase week and year	38,670			2,507,810

* Less coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1869 and 1870.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Dec. 31, 1870, compared with week ending Dec. 31, 1869.

COMPANIES.	1869. Week.	1869. Year.	1870. Week.	1870. Year.
B. & O. R. R.			15,605	1,061,068
C. & O. Canal				594,403
H. & B. T. R. R.	5,863	359,408	5,752	315,921
Harrisburg & D.		....		576,560
L. V. R. R.		21,287		13 847
P. & N.Y. C. & R. Co.	....	....		239 550

Penn. and N. Y. Canal and Railroad Co.

REPORT of Coal Transported via the Pennsylvania and New York Canal and Railroad Company, for week ending Dec. 31, 1870:

	WEEK.	LAST YEAR	INCREASE.	TOTAL.
Anthracite	4,395 13	3 920 13	97. 15	22,619 15
Bituminous	3,081 00	3,.92 00	288 00	18 016 00
Total	7,.76 13	7,772 13		40,636 1

Report of Coal Transported over Lehigh Valley Railroad

Three days ending December 31, 1870, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	10,062 03	45,068 19
" Hazleton	26,987 06	189,133 17
" Upper Lehigh	65 12	289 19
" Beaver Meadow	9,767 02	50,415 10
" Mahanoy	5,174 17	37,221 17
" Mauch Chunk	147 11	750 05
Total Anthracite	51,804 11	292,879 07
Bituminous Coal from all sources	1,615 00	1,615 00
Total by rail and canal	53,519 11	294,494 07
Same time last year	56,784 12	249,876 04
Increase		44,618 03
Decrease	5,265 01	
Forwarded East from M'h Chunk by rail	45,124 03	252,615 08
Same time last year	52,093 14	227,.61 03
Increase		25,254 05
Decrease	6 909 11	

RECAPITULATION.

Forwarded East from M'h Chunk by rail	45,174 03	252,605 08
To N. C. R. R., at Mount Carmel		
Forwarded North from L. & B. Junction	4,885 13	22,601 00
To L. & S. R. R. at Packerton for rail	212 17	1,296 01
Delivered at M'h Chunk	64 00	215 14
Delivered on line of road above Mauch Chunk	286 00	1,410 03
Delivered above M. Chunk for use of L. V. R.R.	1,197 08	5,166 10
To L. & S. R. R., at P'n Hav., for railroad	94 10	94 10
Do. for canal		7,060 19
At M. Chunk for canal		2,411 02
Total Anthracite	51 904 11	292,879 07
Bituminous Coal	1,615 00	1,614 00
Total all kinds	53,519 11	294,494 7

Report of Coal Transported by the Lehigh Coal and Nav. Co.'s Railroads and Canals,

Week ending December 31, 1870—Compared with same time last year.

WHERE SHIPPED FROM	WEEK, 1870. tons cwt	WEEK, 1869. tons cwt	YEAR 1870. tons cwt.	YEAR, 1869. tons cwt.
Wyoming Region	16532 14	25679 03	1247.09 06	846958 13
Upper Lehigh Region	3481 01		157531 11	77856 06
Mahanoy Region			3069 03	2705 07
Hazleton Region	292 00	122 16	319323 19	123066 18
Beaver Meadow Region			146331 12	87646 08
Mauch Chunk Region	10405 16	6805 16	269.35 14	449892 18
Totals	30721 11	22407 15	2143131 04	1596726 12
Increase	8313 16		546404 12	
Decrease				
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	29640 19	22058 19	1120360 06	933569 06
Forwarded East of Mch Chunk by Canal			789079 00	604218 13
Delivered at and above Mauch Chunk	1116 12	260 12	49425 01	34548 04
Delivered to L. & B. R. at Plymouth Bridge		88 04	184266 17	19239 05
L. V. R. R. at Sugar N.				5151 03
Totals	30721 41	22407 15	2143131 04	1596726 12
Of the above there was transported on acc'nt of L. C. & N. Co.	10970 03	6831 10	325467 07	482502 10
W.-B. C. & I. Co.	13888 03	8972 05	6465.1 19	420428 10
Totals.	24858 06	15703 13	972059 06	902931 00
Increase	9154 13		69128 06	
Decrease				

Delaware & Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company, for week ending Saturday, December 31, 1870.

	WEEK.	SEASON.
North	2,621 10	1,934,111 08
South	7,006 03	430,561 16
Total	9,627 13	2,364,673 04
CORRESPONDING TIME IN 1869:		
North	6,637 08	1,403,431 05
South	1,212 01	122,182 05
Total	7,849 09	1,525,613 10
Decrease North	4,015 12	Inc. 530,680 03
Increase South	5,794 04	Inc. 308,379 11
Total Decrease	1,778 04	Inc. 839,059 14

The following is a statement of coal transported by the Delaware and Hudson Canal Company, for the week ending December 31, 1870.

	WEEK.	SEASON.
By Del. and Hud. Canal		1,292 675 00
By Railroad	12,234 00	532,234 00
South	7,006 00	430,562 00
Total	19,240 00	2,255,471 00
By Jefferson R.R.		14,477 00
Corresponding time in 1869.		2,269,948 00
By Del. and Hud. Canal		1,106,280 00
By Railroad	10,911 00	190 369 00
South	1,212 00	123,899 00
Total	12,123 00	1,520,548 00
Increase	749,400 00	

Shipments of Cumberland Coal

for the week ending Saturday, December 31, and for the year 1870:

SHIPPED BY	B. & O. R. R.	C. & O. CANAL.	TOTAL.
Cooke M.	8 00	.....	8 00
Borden	3,393 12	.....	1 393 12
Consolidation	3,436 19	.....	3,436 19
Spruce Hill	478 12	.....	478 12
Midlothian	....	.....	....
H. and Baltimore	70 05	.....	79 05
do Va M	1,084 09	.....	1,984 09
V C & I Co	1,040 02	.....	1,040 02
G. C. C. and I.	624 08	.....	624 08
Big Vein	378 17	.....	378 17
Maryland	....	.....	....
American	1,446 19	.....	1,446 19
Atlantic	648 08	.....	648 08
Piedmont	1,482 00	.....	1,482 00
Swanton	569 00	.....	569 00
Barton	524 00	.....	524 00
Potomac	914 05	.....	914 05
George's Creek M. C.	293 00	.....	293 00
Franklin	1,213 03	.....	1,213 03
Total week	15,605 19	.....	15,605 19
Previous	1045 46215	594,40314	1,642,155 09
Total year	1,061,06814	196,69214	1,657,76108

Statement of coal transported over the Cumberland and Pennsylvania Railroad during the week ending Saturday, Dec. 31, and during the year 1870, compared with the corresponding period of 1869:

YEAR.	WEEK. C. & O. CANAL. Tons. Cwt.	B. & O. R. R. Tons. Cwt.	TOTAL. Tons. Cwt.
1870		11,886 13	11,866 13
1869		13,352 00	13,352 00
Increase		1,465,07	1,465 07
Decrease			

YEAR.	C. & O. CANAL.	B. & O. R. R.	TOTAL.
1870	52.,196 16	894,184 11	1,414,381 07
1869	573,243 17	998,625 11	1,571,869 08
Increase			
Decrease	53,047 01	104,441 00	157,488 01

Delaware, Lackawanna, and Western Railroad.

COAL Transported for the week ending Saturday, December 31, 1870.

	WEEK. tons. cwt.	YEAR. tons. cwt.
Shipped North	1,808.17	669,843 04
Shipped South	395.15	1,678,258 04
Total	2,204,12	2,348,101 08
For the corresponding time last year.		
Shipped North	17,453,13	488 172 18
Shipped South	27,630,13	1,110,815 01
Total	40,074,06	1,598,987 19
Increase		784,113 09
Decrease	37,869,14	

Pennsylvania Coal Company,

Shipments of Pittston Coal for the week ending Dec. 31, 1870.

	1870. WEEK.	1870. YEAR.	1869. WEEK.	1869. YEAR.
By Railway	109 06	1,009 405 02	14,213 08	947,930 01
" Canal	— —	16,602 12	— —	18,706 18
Total	109 06	1,0.6,008 14	14.213 08	966,636 19

Increase, 1870, 119,371 01 tons.

Summit Branch Railroad Company.

The following is the quantity of Coal shipped from Williamstown Colliery, for week ending Saturday, December 31, 1870 2,626 15
Same time last year 668 03

Increase, Tons	1,958 16
Total amount shipped to date	296,423 02
Same time last year	201,017 16
Increase, Tons	95,405 10

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK, January 3. R. A.	W. A.	AT PHILADELPHIA January 2. R. A.	W. A.
SCHUYLKILL.				
Lump	$— —	$5 00	4 75	4 50
Steamer	— —	5 00	— —	4 50
Broken	— —	5 50	— —	4 50 to 4 75
Egg	5 50 to 6 00	5 00 to 5 25	— —	4 50 to 4 75
Stove	5 50 to 6 00	5 25 5 50	— —	4 50 to 4 75
Chestnut	4 00 to 4 50	4 00 4 25	— —	4 25 to — —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	— —	— —	— —	— —
Broken	— —	— —	— —	— —
Egg	— —	— —	— —	— —
Stove	— —	— —	— —	— —
Chestnut	— —	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Diamond Vein	R. A.	6 00	— —	— —
New England	"	— —	— —	— —
Locust Dale	W. A.	5 50	— —	— —
Honey Brook Leh'h	W. A.	6 00 to 6 50	— —	— —
Spring Mountain	" "	6 00 to 6 50	— —	— —
Sugar Creek	" "	6 00 to 6 50	— —	— —
Sugar Loaf	" "	6 00 to 6 50	— —	— —
Old Comp'y's	" "	6 00 to 6 50	— —	— —
Cross Creek	" "	6 00 to 6 50	— —	— —
Room Run	"	— —	— —	— —
Girardville	" "	— —	— —	4 75
McMichael	" "	— —	— —	4 75
Shamokin	" "	5 50	5 25	— —
Lykens Valley	" "	— —	5 75	— —
Broad Top	" "	5 50	— —	— —
Hill & Harris	" "	— —	4 75	— —
Henry Clay	" "	— —	5 00	— —
Powelton	" "	5 50	— —	4 75

*Dealers in these coals may be found in our advertising columns.]

Company Coals.

January, 1871.

	L.	Str.	Gra.	Eg.	Sto.	Ches
Scranton at E. Port	— —	— —	— —	— —	— —	— —
Pittston at Weehawken	— —	— —	— —	— —	— —	— —
Lackawana at do	— —	— —	— —	— —	— —	— —
Wilk'b're at Hoboken	— —	— —	— —	— —	— —	— —
Old Co. Lehigh at Pt. Johnston	— —	— —	— —	— —	— —	— —
Lehigh at E. Port	— —	— —	— —	— —	— —	— —

For freights to different points, see "Freights."

Prices for Coal at Mauch Chunk.

January 1871.

	F. L.	Bro.	Gra.	Eg.	Sto.	Chest.
Lehigh	$3 00	$3 75	$3 75	$3 75	$4 00	$3 00
Wilkesbarre	3 00	3 75	3 75	3 75	4 00	3 00

For freight to Elizabethport and to New York see "Freights."

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein f.o.b. at Phila.	$5 00	
Lemon " "	"	4 75
Cumberland Vein Coal	"	4 75
Consolidation Coal Co.'s on board	N. Y.	7 00
Maryland Coal Co.	"	7 00

Prices at Baltimore—January, 1871.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 80@— —
Pittston and Plymouth, do	5 60@5 75
Shamokin Red or White Ash, do	— —@6 00
Lykens Valley Red Ash, do	6 25@— —
Zerba Valley	5 25@— —
Trevorton	6 00@— —
By retail, all kinds per ton of 2240 lbs	7 25@8 25
Georges Creek & Cumberland f. o. b. at Locust Point for cargoes	4 60@4 75
Fairmont and Clarksburg gas, f. o. b. at L. Point	6 00@6 50

Prices at Georget'n, D.C., & Alexandria, Va.

January, 1871.

George's Creek and Cumberland f. o. b. for shipping $4 40

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$— —@5 50
Lykens Valley	— —@6 25
Shamokin Red or White Ash	— —@5 75
Trevorton and Zerba Valley	— —@6 00

Prices of Gas Coals.

January, 1871.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr. 41-43 Pine st., N.Y. Duty, $1 25, gold.

	Coarse.	Slack.
Block House	$1 75	@— 75
Gowrie	1 75	@— 75

Corrected by Bird, Perkins & Job, 86 South street.

	Coarse.	Culm of Coal.
Pictou	$2 25	@1 25
Sydney	2 25	@— 80
Lingan	1 75	@— 80
Little Glace Bay	1 75	@1 00
Caledonia	1 60	@— 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Currency.
Westmoreland	7 75 @8 00
Fairmount Gas Coal Co. of N. Y.	7 50 @— —
Despard Coal Co.	$7 50 @— —
Penn.	7 75 @8 00
Newburg Orrel Gas	— — @— —
West Fairmount Gs Coal	8 00 @— —

AT PHILADELPHIA.

Powelton	$7 80

Prices of Foreign Coals.

January, 1871.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 22 Pine street New York.

Liverpool Gas Caking	$ 9 00@— —
" " Cannel	11 50@12 50
" House	— —@16 00
" " Orrel	12 00@14 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$15 00@17 50
" " Cannel	18 00@20 00

Per ton 2,000 lbs. delivered.

Foreign and Provincial Freights.

January, 1871.

Foreign.

Newcastle and Ports on Tyne, per keel of 21 1-5 tons	£14 00@£16 00
Liverpool, 5 per cent primage	13s @16. ton

TO NEW YORK.

Provincial

Sidney	$3 00
Lingan	3 00
Cow Bay	— —
Port Caledonia	2 25
Little Glace Bay	3 00

TO BOSTON.

Sydney	$2 70
Lingan	2 70
Cow Bay	— —
Port Caledonia	3 00
Little Glace Bay	2 75

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Port Carbon	$2 00
Less drawback of 50 cents on all Coal shipped east of New Brunswick and south of Cape Henry.	

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Easton	$ 84
C. R. R., N. J., Easton to Elizabethport	1 21
Shipping expenses at Elizabethport	25
Warfage	10
Total	$2 40

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R., or L. & S. R. R. from M. C. to Easton	$ 84
C. R. R., of N. J., Easton to Pt. Johnson	1 24
Shipping expenses	25
Warfage	10
Total	$2 43

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Easton	$ 84
Morris & Essex R. R. Easton to Hoboken	1 36
Shipping expenses	25
Warfage	10
Total	$2 55

TO SOUTH AMBOY.

L. V. R. R.	84
R. & D. R. R.	1 14
Cam. & Am. R. R.	
Shipping Expenses	25
Total	$2 23

PENN HAVEN TO ELIZABETHPORT.

L. V. RR. Penn Haven to Easton	84
C. RR. of N. J. Easton to Elizabethport	1 21
Shipping expenses	25
Wharfage	10
Total	$2 40

Freights.—January, 1871.

TO EASTERN PORTS.	From Phila'd'a.	From E. Port and Port Johnston.	From Newbury.	From Rondout.
Amesbury	$2 50	$2 00	$	$
Bangor	2 30	1 60	1 60	
Bath	2 30	1 75		
Boston	2 10	1 50	2 25	1 90
Bridgeport	1 75	1 10	1 10	1 20
Bristol	1 75	1 40	1 40	
Cambridgeport	2 00	2 00		
Derby	2 00	1 20		
Dighton	2 30	1 60	1 45	
East Cambridge	2 35	2 00		
Fall River	2 10	1 40	1 40	
Hackensack	1 75	1 00		
Hartford	2 50	1 80		
Jersey City	1 40	60		
Middletown	2 25	1 25		
Mystic		1 35	1 30	
New Bedford	2 00	1 40		
Newburyport	2 65	1 85		
New Haven	1 90	1 00	1 10	1 20
New London	1 75	1 25	1 25	1 30
Newport	1 35	1 40	1 40	
New York	1 80	60	70	
Norwalk	2 00	1 00	1 05	
Norwich	2 30	1 30	1 35	1 40
Pawtucket	2 30	1 50	1 60	
Portland	2 30	1 85		
Portsmouth, N. H.	1 45	1 85		1 85
Providence	2 00	1 25	1 45	1 45
Rockport	2 10	1 65		
Saco	1 75	1 75		
Sag Harbor	1 70	1 20	1 30	
Salem	2 35	1 65	2 25	21
Stamford	2 00	1 00	1 00	
Stonington	2 00	1 30	1 25	
Taunton	2 30	1 75		
Warren		1 40	1 45	
Washington	1 25			

TO RIVER PORTS.				
Albany		90	60	
Catskill		— —	50	
Cocksackie		— —	50	
Coeyman's		— —	75	
Cold Spring		— —	35	
Fishkill		— —	30	
Haverstraw		50	60	
Hudson		— —	50	
New York		— —	70	
Nyack		60	60	
Poughkeepsie		— —	35	
Rhinebeck		— —	30	
Rondout		— —	— —	
Saugerties		— —	40	
Sing Sing		— —	75	
Staatsburgh		— —	55	
Tarrytown		80	75	
Troy		90	75	
West Point		— —	35	
Yonkers		40	50	

Towing Rates.

TO EASTERN PORTS.

	Per Ton.
To New Haven	$ 40
Bridgeport	40
Southport	40
Westport	40
Norwalk	40
Stamford	40
	Per Boat.
Greenwich	$70 00
Port Chester	80 00
Mamaroneck	70 00
Glen Cove	60 00
New Rochelle	55 00
East Chester	60 00
West Chester	30 00
White Stone	30 00
College Point	25 00
West Farms	25 00
Flushing	30 00
Harlem and Mott Haven	20 00
Port Morris	20 00
Ninety-first street and Astoria	16 00

Boats beyond Port Chester, with less than 200 tons, $60 per Boat.

TO RIVER PORTS.

Boats of 150—250 Tons.	Per Ton.
To Manhattanville	8 cents.
Spuyten Duyvil	8 "
Yonkers	9 "
Hastings	10 "
Piermont	12 "
Dobbs' Ferry	12 "
Nyack	14 "
Tarrytown	15 "
Sing Sing	16 "
Oroton Landing	17 "
Haverstraw	17 "
Verplanck's	17 "
Peekskill	18 "
West Point	20 "
Cold Spring	20 "
Newburgh	22 "
Poughkeepsie	22 "
Rondout	23 "
Boats of 100 Tons.	Per Boat
To Manhattanville, and Return	$11 00
Spuyten Duyvil	13 00
Yonkers	15 00
Sing Sing	20 00
Peekskill	25 00

METALS.

NEW YORK, January 5, 1871.

IRON.—Duty: Bars, 1 to 1½ cents ₱ lb; Railroad, 70 cents ₱ 100 lbs.; Boiler and Plate, 1¼ cents ₱ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ₱ lb; Pig, 9 ₱ ton; Polished Sheet, 3 cents ₱ lb.

	Store Prices.
Pig, Scotch No. 1, ₱ ton	32 00@34 00
Pig, American, No. 1	30 00@30 00
Pig, American, No. 2	29 00@30 00
Pig, American, Forge	25 00@27 00
Bar, Refined, English and American	— —@75 00
Bar, Swedes, assorted sizes (gold)	85 00@100 00
	Store Prices, Cash.
Bar, Swedes, ord'y sizes, less 5 ₱ ct.	— —@110 00
Bar, Refined	75 00@ 80 00
Bar, Common	70 00@ 72 50
Scroll	97 50@125 —
Ovals and half-round	97 50@125 —

Rand	"	"	92 50@ 95 00
Horse Shoe	"	"	95 —@ — —
Rods, ⅝ to 5-16 inch	"	"	82 50@ — —
Hoop	"	"	102 50@140 00
Nail rod, less 5 ₱ ct.			6¾—@ — —
Sheet, Russia, as to Nos. (gold)			10¼@—11
Sheet, Single, D. and T. Common			—4¾@— 6
Sheet, Galv'd, Nos. 14 to 26 10 and 12c. Nos. 27, 28, and 29, 13@14			
Rails, English (gold), ₱ ton			56 00 @58 00
Rails, American, at Works in Pa			70 00 @71 00

STEEL.—Duty: Bars and Ingots, valued at 7 cents ₱ ₱ or under, 2½ cents; over 7 cents and not above 11, 3 cents ₱ ₱; over 11 cents, 2½ cents ₱ ₱. and 10 ₱ cent ad val. (Sterling prices.)

English Cast (2d and 1st quality)	₱ ₱		— 15 @— 18
English Spring (2d and 1st quality)			— 7 @— 10
English Blister (2d and 1st quality)			— 10 @— 17
English Machinery			— 11½@— 14
English German (2d and 1st quality)			— 13 @— 15
American Blister "Black Diamond"			— — @— 12
American, Cast, Tool	do.		— 16 @— 17
American, Spring	do.		— 9 @— 11
American Machinery	do.		— — @— 12
American German	do.		— 9 @— 12

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 20 cents ₱ ₱; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₱ ₱	— @— 30
Copper Bolts	— @— 32
Copper Braziers, 16oz. and over	— @— 32
Copper Nails	— @— 37
Copper, Old Sheathing, &c., clean	19 @— 20
Copper, Chili Pig	— @— —
Copper, American Ingot	22½@— 22½
Yellow Metal, New Sheating	— @— 22
Yellow Metal Bolts	24 @— —
Yellow Metal Nails	— @— 22

LEAD.—Duty: Pig, $2 ₱ 100 lbs.; old Lead, 1½ cents ₱ ₱; Pipe and Sheet, 2½ cents ₱ ₱.

Galena, ₱ 100 lbs	$— @— —
Spanish (gold)	$ 25 @6 30
German, do.	6 30 @6 30
English, do.	6 30 @6 50
Bar (net)	7 25 @7 50
Pipe (net)	7 25 @7 50
Sheet	7 75 @8 00

TIN.—Duty: Pig, Bars, and Blocks, 15 ₱ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₱ cent. ad val.

	Gold ₱ lb.
Banca	37½@—
Straits	33 @—
English	32½@32½

PLATES.

Fair to Good Brands.	Gold.	Currency.
I. C. Charcoal, ₱ box	$8 25 @8 50	$9 50 @ 9 75
I. C. Coke	7 00 @7 50	8 00 @ 8 75
Coke Terne	5 75 @6 75	6 75 @ 7 25
Charcoal Terne	7 25 @8 00	8 50 @ 9 25

SPELTER.—Duty: In Pigs, Bars, and Plates, $1 50 ₱ 100lb

	Gold.
Plates, Foreign, ₱ 100 lbs.	$ 37½@ 6 12½
Plates, Domestic, ₱ lb.	5½@— 11½

REMARKS.

TIN.—Pig continues in demand at full prices; the recent large movement was based upon the higher prices ruling in London. At one time English was quoted there £133, afterwards declined to £131, but now has advanced to £134, and Straits £132 10s. Since our last, 3,000 slab Straits have been sold, including 1,000 to arrive at 33c., now held at 33½c., English 33@33½c., and Banca 37½@38c., all gold. Plates are quiet, but holders are strengthened by advices of an advance of 1s. per box in Liverpool, and the tendency of prices is in their favor.

COPPER.—The manufactures of Copper and Yellow Metal are steady at our quoted rates. Ingot is in moderate request at firm prices; sales have been made of 200,000 lb. Lake at 22½@22¾c., cash, including some for delivery February 15 at 22¾; 50,000 lb. Quincy, for January 15, 23; 50,000 lb. Central, 22¾, cash; and 50,000 lb. Tennessee, 22¾.

Estimated stock of Ingot at this port, Jan. 1:

	1868.	1869.	1870.	1871.
Lake Superior, lb.	7,000,000	6,000,000	7,000,000	9,5.0,000
Balt., Tennessee, etc.	3,0.0,000	1,000,000	2,000,000	1,230,000

SPELTER.—Foreign remains very quiet; we quote nominally 6@6¼c., gold; domestic 8¼c.

ZINC.—Sheet Zinc is dull at 8¼c.; French, 10a 11c.; American, 9¼c.; Manganese, 4½c.

Mining Stocks.

NEW YORK, January 5, 1871.

We are again favored with a report from the Mining Stock Board. The report indicates more activity in the Board than we have noticed for a long time past. With the exception of Grass Valley, all of the stocks on the list have decidedly advanced in comparison with the report which we gave two weeks ago. Sales of 500 shares Central Gold were effected this A. M. at 12, and 500 Bates & Baxter at 27. Below is the list of quotations in full:

	BID.	ASKED
Bates and Baxter	27	—
Central Gold	12	15
Consolidated Gregory	30	50
Grass Valley	5	10
Gunnell	—	—
Smith and Farmelee	15	30
Benton	3	10
Black Hawk	20	40
N. Y. & Eldora	20	—
Quartz Hill	10	17

San Francisco Stock Market.

We have reports from the San Francisco Stock Market per telegraph, dated January 4. With the exception of Gould & Curry, all stocks on the list have decidedly advanced. Below is the report in full:

Savage	53½
Yellow Jacket	41½
Kentuck	No sales.
Chollar Potosi	73
Gould & Curry	41
Belcher	7
Imperial	19½
Ama ior	No sales.
Crown Point	—
Hale & Norcross	—

Petroleum.

PETROLEUM.—Petroleum is active; the quotations do not materially vary from our last report. Sales of 1,500 shares b. 3 were made this A. M. at 70; 1,000 United Petroleum Farms sold at 16, and 200 shares of Home were sold at 1.50, and 300 shares at 1.55. We hope that this is but the inauguration of more extenseve transactions in the Mining Stock Board, and our convictions are at fault if eventually the Board does not monopolize the control of buying and selling of stocks which belongs to itself. Below is the report of quotations in full:

	BID.	ASKE
Bergen Coal and Oil	40	20
Bennehoff Run	20	25
Blood Farm	—	—
Brevoort	—	—
Bilvin Oil	—	50
Buchanan Farm	20	—
Central	40	50
	97	70
Clinton	—	—
Home	140	160
Phillips Pet	10	—
Rynd Farm	25	30
United Petroleum Farms	17	19
United States	—	70
National	—	—
New York & Allegheney	150	250
Northern Light	45	—
Pit ole Creek	50	75
Rathbone Oil	—	40
Second National	—	—
Sherman & B	—	—
Tarr Farm	—	—

The Slate Trade.

[Corrected weekly.]

(A "square" represents 100 superficial feet.)

PRICES OF ROOFING SLATE.

Vermont purple, 1st quality, per square	$6 50@ 7 00
" green, 1st " "	6 50@ 7 00
" red, 1st " "	15 00@16 00
" variegated, " "	5 75@ 6 20
Pa. b'k and d'k blue, 1st qual., "	6 00@ 7 05

PENNSYLVANIA SLATE TRADE.

SHIPMENTS OF SLATE OVER THE LEHIGH VALLEY, AND LEHIGH AND SUSQUEHANNA R. R., AND THE LEHIGH CANAL:

For the week ending Dec. 31, 1870.

LEHIGH VALLEY R. R.

ROOFING SLATE.

Girard Slate Co	315 squares.
Jones & Williams	" "
D. Williams & Co	— "
Saylor & Morgan	35 "
H. Williams	210 "
Lehigh Slate Co	105 "
American Slate Co	35 "
Hope	— "
Keystone	— "
Locke	— "
J. Anthony	— "
Kuntz & Woodning	— "
Total	1015 "

SCHOOL SLATES.

D. Williams	11 cases.
Lehigh Slate Co	2 "
Locke Slate Co	10 "
H. Kuntz	4 "
Total	27 "

BLACK BOARDS.

Yerkes & Martin	7 "
Lehigh Slate Co	— "

MANTELS.

Yerkes & Martin	42 "
Lehigh Slate Co	34 "
Total	76 "

MILL STOCK.

Jones & Williams	— "
Philada. S. Mantle Co	— "
Lehigh Slate Co	2 "
Yerkes & Martin	1 "
	3

TILING, &C.

Lehigh Slate Co	— "
Yerkes & Martin	— "
R. Hughes	3 "
H. F. Martin	1 "
	4 "

LEHIGH AND SUSQUEHANNA R. R.

ROOFING SLATE.

Twin City Slate Co	— squares.
N. Y. & Penn	— "
J. M. Coffin & Co	— "
William Parry	— "
Mauch Chunk Slate Co	— "
J. Beck & Co	— "
Eagle Slate Co	215 "
Continental	35 "
Heimbach Slate Co	245 "
R. R. Custer	70 "
Total	595

	Dec. 31.	Previously.	Total for Year.
L. and S. R. R.	135	11,631	12,276
L. V. R. R.	595	25,468	26,483
Lehigh Canal	—	4,762	4,762
Total	730	41,911	435,21

The Ramai Planting and Manufacturing Company.

SINCE the introduction of this fibrous plant into our State, says the New Orleans *Price Current*, we have strongly advocated its cultivation, at least to the extent of demonstrating from actual experience whether or not it is practicable to cultivate it successfully and profitably on a large scale, and, possibly, as a staple. We are pleased to see that a company has been formed, and incorporated under the general laws of the State, for the purpose of cultivating the *Ramie* extensively; and from the practical character and sound judgment of the gentlemen who are to con duct the affairs of the company, we are disposed to augur the best results. A portion of Mr. JOHN DAVIDSON'S splendid "Poydras Plantation," in the Parish of Saint Bernard, is to be the field of operations.

California Cork.

THE San Francisco *Call* of the 19th ult. says: A gentleman of this city, just returned from a visit to the Sonoma valley, exhibited to us yesterday a small sample of cork, chipped from one of a group of several trees growing there, known as the "cork oak." The specimen shown is the genuine article, and in texture affords proof, as the trees do in growth and vigor, that they will flourish in this climate. The trees alluded to are the product of acorns received from the Patent Office at Washington, and planted fifteen years ago. They average about twelve feet in height, and are from seven to eight inches in diameter.

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The New Sutro Bill.

IN the Senate of the United States, December 8, 1870, Mr. NYE asked, and by unanimous consent obtained, leave to bring in the following bill; which was read twice, referred to the Committee on Public Lands, and ordered to be printed.

A Bill to create a fund to be known as "the mineral land fund," and for other purposes.

Whereas our public lands contain mines of the precious metals, which are unsurpassed in richness, and can with proper development be made speedily to enhance the value of all property, and thereby relieve the burdens of the people; and whereas a wise policy indicates that the revenue derived from our mineral lands should, to some extent, be devoted again to the much needed development of that important interest; and whereas Congress, by an act approved July twenty-five, eighteen hundred and sixty-six, authorized the construction of a draining and exploring tunnel to the Comstock lode, in the State of Nevada, and granted to ADOLPH SUTRO certain rights and privileges, which have been assigned, transferred, and set over to a corporation duly organized under the laws of the State of California, and known as the "Sutro Tunnel Company;" and whereas great benefits will accrue to the people of the United States from the construction of said tunnel, which, as a great geological survey, penetrating into the very bowels of an argentiferous mountain to a greater depth than has yet been reached by any similar work in the world, will establish the value of our mineral domain; and whereas this work bears a national character, and its magnitude is beyond the capacity of private enterprise, and the security offered to the Government is ample for the repayment of any sums to be advanced under this act: Therefore,

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Treasury is hereby authorized and directed to set spart, as a special fund, to be known as "the mineral land fund," all moneys received by the United States from the sale of mineral lands, under the act entitled "An act granting the right of way to ditch and canal owners over the public lands, and for other purposes," approved July twenty-six, eighteen hundred and sixty-six, and the act amendatory thereto, approved July nine, eighteen hundred and seventy, to be used in fostering the mining interest, as Congress may hereafter direct; and the Secretary of the Treasury shall, from said fund, from time to time, pay over to the Sutro Tunnel Company, or its duly authorized agent, such sums as herein provided for, not to exceed in the aggregate the sum of three millions of dollars.

SEC. 2. *And be it further enacted*, That whenever the said Sutro Tunnel Company shall have completed five hundred feet of said tunnel, or of the shafts or branches, the Secretary of the Treasury, upon application to him by such person as the said Sutro Tunnel Company shall designate and order in writing, shall, from the aforesaid fund, pay over to said person fifty thousand dollars as a part of the sum to be loaned by this act; and in like manner shall pay over to said persons to be so designated a like sum upon the completion by said company of each and every additional five hundred feet of tunnel, shafts, or branches, as hereinafter specified: *Provided*, That the several payments shall not be made as aforesaid by the Secretary of the Treasury until the commissioners hereinafter mentioned shall report, and the superintendent of said company shall verify under oath to said Secretary that each of the sections of five hundred feet of said tunnel, shafts, or branches upon which the several instalments shall be demanded are fully made and completed in accordance with the requirements of this act: *And provided*, That all payments under this act shall be made out of appropriations hereafter to be made.

SEC. 3. *And be it further enacted*, That in order to secure the United States, as hereinafter provided, in the re-payment by said company of the sums so paid over to the said Sutro Tunnel Company, or to the persons by it designated as above, and the expenses of the commissioners, the payment of said sums shall ipso facto constitute a first mortgage and lien on the whole of said tunnel, together with all the engines, buildings, appurtenances, easements, and privileges thereunto belonging. And after the completion of said main tunnel to its intersection with the said Comstock lode, twenty-five per centum of the net amount collected for tolls, drainage, transportation of ore, rock, and material, or in any other manner, after deducting the necessary expenses, shall, on the first day of January, and on the first day of July in each year, be paid by the said company into the Treasury of the United States, which moneys shall be applied to and used for the re-payment of the sums so advanced and paid, until the whole amount shall be re-paid to the United States; and ten per centum of said net amount collected after completion of the said main tunnel to its intersection with the Comstock lode, shall be paid over by the said company into the Treasury of the United States, on the first day of January and the first day of July of each year forever, to be set apart by the Secretary of the Treasury as an endowment fund, to be invested in government securities, and the interest of which shall be used for the establishment and maintenance of a national school of mines, subject to such legislation as Congress may hereafter drovide; and on failure or refusal of said company to pay over the said sums of money, or any part of them, when required so to do by the Secretary of the Treasury, in accordance with the provisions of this act, the said tunnel, with all the rights, privileges, and appurtenances thereunto belonging, may be taken possession of by the Secretary of the Treasury for the use and benefit of the United States.

SEC. 4. *And be it further enacted*, That the conditions upon which the credit of the Government shall be extended to said work are as follows:

First. That the said Sutro Tunnel Company shall enter upon the construction of said tunnel from and after the passage of this act, and shall prosecute the same with all reasonable diligence, and shall complete the same within ten years from the date of this act.

Second. That the said tunnel shall, from its initial point in the foot-hills near Carson River, extend in a westerly direction four miles, more or less, to and beyond the easterly limit of said Comstock lode, and branches shall be constructed from said main tunnel northerly and southerly to such extent as may be by said company deemed profitable and expedient.

Third. That said tunnel shall be at least ten feet high and twelve feet wide outside of timbers, and shall have a fall of not less than one inch in each one hundred feet, and shall, on or before its completion, be provided with all necessary supports, double railroad tracks, and working shafts, the whole work to be substantial, permanent, and workmanlike, and to be subject during its progress to the examination and approval of a board of three commissioners, which shall consist of the governor and the surveyor general of the State of Nevada, and one of whom shall be an engineer of the Army, to be appointed by the President of the United States.

SEC. 5. *And be it further enacted*, That in case of failure on the part of said Sutro Tunnel Company to prosecute said work, or to complete said main tunnel within the period herein specified, or to keep the same in good repair and condition, or of a neglect to perform any and all the conditions hereinbefore stated, at any time prior to the re-payment to the Government of the said sums so advanced and paid over, the President of the United States shall notify the president of said company in writing, specifying wherein the same is in default; and if upon receipt of such notice they shall fail to comply with the terms and conditions of this act, set forth and specified in said notice, for the space of six months after the service thereof, the President may declare all rights of said company under this act forfeited, and may take such proceedings as he may deem advisable to terminate the possession of said company.

Peat as Fuel for Iron Working.

The following notes deserve the attention of iron producers and manufacturers. They are taken from a pamphlet describing the AUBIN method of making peat fuel, and do not perhaps give an entirely impartial statement of the matter. The presence of that deadly foe of the iron worker—phosphorus—has been ignored, but notwithstanding there is but little doubt that in many instances peat could be used advantageously and with economy. The amount of ash which peat gives varies considerably, but is generally somewhere between 10 and 30 per cent., which sometimes contains as high as 2½ per cent. of phosphoric acid:

"The French Government and capitalists, having ascertained the injurious effect produced upon the general prosperity of the manufacturing classes by the exportation of large sums of money, for the purpose of procuring from other countries a considerable portion of their supply of fuel, have, of late years, given much attention to the economical value of the deposits of peat found in different parts of their country. Careful investigations and practical experiments have been instituted, in order definitely to determine the relative value of peat fuel, as compared with coal, coke, wood and charcoal. The details of their several operations are too voluminous for reproduction here; but the *results* obtained are too important not to interest American manufacturers, railroad capitalists and iron workers. We will, therefore, confine the analyses of the different reports to the useful and practical points we can gather from them.

"The labor of the investigators has not been lost. In the tables of Report of 'Imperial Engineers' Office of Mining,' by exhibit for the year 1864, the comparatively large amount of 359,310 tons of peat fuel had been consumed. The coal consumed at the above period reached about twelve millions of tons, of which nearly half was imported; and it was calculated that if peat was substituted, the present known deposits of that substance could alone supply the demand of France for more than nine hundred years.

"They also report that 'practical workings have demonstrated the following:

"'One (1) pound of charcoal is equivalent, in heating power,
'to 1 pound peat charcoal;
'to 1 " coal coke;
'to 1.42 lbs. best bituminous coal;
'to 1.63 " crude peat fuel;
'to 2.70 " dried hard-wood;
'and that it requires 2.03 pounds of crude peat to produce one pound of peat charcoal.'

"Applying the above European figures (which are completely confirmed by our own experiments) to the case of our American iron charcoal manufacture, we are enabled to make the following comparisons:

"The iron ore from the famous Iron Mountain of Missouri, when reduced by wood charcoal, required 160 bushels per ton of metal (Am. Cy., vol. ix., p. 612); 160 bushels charcoal (16 pounds to bushel, = 2,560 pounds), or at 12½ cents per bushel, cost $20. The same weight of peat charcoal, at $8 per ton, would be only $10 24; if the owners of iron works manufactured their own fuel, (the deposits of which invariably occur near their mines) the cost would again be materially reduced.

"The official French tables show that in the manufacture of pig iron it takes, to produce one ton of the metal, 2,800 pounds wood charcoal, costing 114 francs ($22 80), or about 13 cents per bushel; 2,800 pounds of peat charcoal, costing $11 20; 4,700 pounds of crude peat, costing 37.60 francs, or $7 52.

"The same report gives a long table of results obtained in the manufacture of iron by the use of several mixture of fuels—wood charcoal with peat fuel, in different proportions, and also of peat charcoal with peat fuel—showing an economy above the old methods of from $5 to $12 per ton of metal; stating also that 'Peat fuel or peat charcoal, when used in high furnaces for the reduction of iron ore, gives to the cast or wrought iron thus obtained a superior quality, which even the best wood charcoal cannot always secure; that from a comparison in the quality of products from different iron works on the European continent, it is found that the iron is more valuable just in proportion with the relative quantity of vegetable fuel used in its manufacture.

"These French experimenters establish this fact: that peat, as a fuel, occupies a prominent position between wood and coal; that the calorific value of peat (merely dried) is twice that of wood, and only one-fifth below that of the best coal, and equal to that of wood charcoal. They explain this by the fact that the principal plants and mosses from which peat is formed contain sixty per cent. of ligneous matter, the fatty and oily substances cementing the other parts together being derived from the water lilies and swamp clover, which contain no solid carbon; that peat possesses all the advantages of the purity of wood charcoal, and is superior to it in one respect, *i. e.*, as the specific weight of peat charcoal is more than twice that of wood charcoal, the contact heat, so much required in the reduction of iron ore, is doubled, and secures thereby a quicker and more perfect operation.

"From the experiments of M. LE SAGE (5th vol. Repertory of Arts) he says: 'Charred ordinary peat seems capable of producing a far more intense heat than common wood charcoal. It is found preferable to all other fuels for case-hardening iron, tempering steel, forging horse-shoes, and welding gun barrels. Since peat is partially carbonized in its native state, when condensed and fully cleaned it must evidently afford a charcoal very superior in calorific power to the porous wood charcoal.'

"FREDERICK OVERMAN states that 'peat charcoal has peculiar advantages for welding steel and iron, and excels all other fuels in this respect; it facilitates the welding steel to steel, or steel to iron, or working of small iron, and causes the adhesion of the metal. It is impossible to account for this peculiar effect except by the composition of its ashes.'

"Presenting the above array of facts, deduced from practical tests made in Europe during the past few years, the American iron worker can look over this country, wherein such vast deposits of iron exist; he need have no fear that the growing scarcity of wood will have serious effect upon his labor; for near him exist large deposits of peat, readily condensible and convertible into charcoal, at a price now but one-half of what the wood charcoal costs. It is not necessary for us to attempt to publish an estimate of the extent of the deposits. They are (even without attention having been commercially turned to them to any degree) widely known and acknowledged to be generously and evenly distributed."

New Publications.

PRACTICAL TREATISE ON THE DIFFERENTIAL AND INTEGRAL CALCULUS, with some of its Applications to Mechanics and Astronomy. By WILLIAM G. PECK, LL D., Professor of Mathematics and Astronomy in Columbia College, and of Mechanics in the School of Mines. A. S. BARNES & Co.: New York and Chicago, 1871.

In this work an attempt has been made to condense the principles of the Calculus into a moderate space, without omitting anything essential to their full and complete development, and the attempt appears to have been successful. The theoretical parts of the Calculus, both differential and integral, together with a multitude of illustrative examples, have been compressed into less than a hundred duodecimo pages. The applications are extensive and complete, including those usually given in treatises on this subject, together with a large number of illustrations to show the method of applying Calculus to mechanics and astronomy. The examples used to illustrate and enforce the rules and principles are so selected as to familiarize the student with the transformations and uses of radical and transcendental qualities, and at the same time to furnish him with a large number of formulæ of the very kind likely to be met with in the study of science. The method employed by the author in developing the work is that of LEIBNITZ, or, as it is more commonly known, the method of infinitesimals. In giving his reasons for adopting this method, the author says: "*First*, it is the method adopted in all practical investigations; *second*, it is the method most easily explained, and most easily comprehended, and *third*, it is a method, as will be shown in the final note, identical in results with the more commonly adopted *method of limits*, differing from it chiefly in its phraseology and in the simplicity of its results." An examination of the final note referred to sustains the assertion that the results of the two methods are logically identical, and a careful survey of the entire work justifies the author in calling it "practical." It is practical, but not in the popular sense of that much-abused word. It is only practical because it places in the hands of the scientist, in the simplest and most available form, a ready and potent tool to aid him in the accomplishment of his work. As such it will not fail to find its true place, and be properly appreciated in the numerous scientific and technical schools that are springing up so rapidly throughout the country, and that are doing so much to show that the *thoroughly scientific* is the only proper basis of the *truly practical*. The reputation of the author is a guarantee of the excellence of the book, which, however, also speaks for itself. Simplicity and precision of style, and logical arrangement and sequence of matter, are qualities more important than frequent in mathematical treatises; and in these respects Professor PECK offers us a model worthy of imitation.

Sulphuric Acid.

WE learn that the Baltimore Smelting Works are now prepared to smelt one hundred and twenty tons of copper ore per day. At present they are not running at their full capacity. The sulphur contained in the iron and copper pyrites is converted into sulphuric acid. The works at present produce between 300 and 400 carboys of acid per day, and expect to at least double their production in a short time. They claim to utilize a larger percentage of the sulphur in the ore than any other works.

THE ENGINEERING AND MINING JOURNAL.

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ROSSITER W. RAYMOND, Ph. D., Editor.

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The New Sutro Tunnel Bill.

IN another column will be found the text of the Bill to aid the Sutro Tunnel, which was introduced in the Senate a few days ago. This Bill differs materially from all its predecessors, and every change which has been made has been, we think, an improvement. In its present form, it provides that the proceeds of the sale of mineral lands shall be set aside, to form a special "mineral land fund"; and that the Sutro Tunnel shall be assisted from this fund, to the extent of three million dollars, advanced as a loan to the tunnel company, and to be repaid with twenty-five per cent. of the net profits of the said company, after which repayment, the money is to constitute an endowment fund for a national school of mines, while the remainder of the "mineral land fund" is to be applied in fostering the mining interest as Congress may direct. This is the outline of the measure, for full details of which we refer the reader to the Bill itself.

It would be premature to discuss at present the particular provisions of the Bill, since it has been referred to the Senate Committee on Public Lands, and may be reported from that committee in a somewhat altered form. It will be the duty of Congress to fix the details with care, and secure a well-balanced and properly-guarded law. It is the principle alone which concerns us now, and upon which we shall say a few words.

In the first place, we have always maintained that the true policy of the Government is not to attempt to obtain a direct revenue from gold and silver mining. This is the course now pursued by the most civilized nations, as may be seen by reference to Commissioner RAYMOND'S first report, in which the principal mining codes of the world are analyzed and compared. At the same time, it is the practice of such nations to tax the mines lightly, for the purpose of obtaining a fund out of which the proper inspection, regulation and assistance are provided for this industry.

The position of this Government differs from that of European states, in the vast extent and mostly unknown character of the mineral deposits on the public lands, and also in the genius of its democratic institutions, which do not favor inspection and regulation of any private industry. It is therefore our policy to transfer the title of the gold and silver mines to individual citizens, and then to let them alone, as much as we do the farmers or mechanics.

There are two ways only, in which funds can fairly be collected to assist the gold and silver mining of the country. One is the sale of mineral lands, and the other is the imposition of a small annual payment upon possessory claims not worked. The latter is at present impossible. It requires the passage of a United States law, rendering the title to possessory claims dependent upon a certain number of days' labor annually, or a certain payment in lieu thereof, to hold the claim. We think such a law would do much good. It has been tried with excellent results in single districts; it ought to be obligatory in all. But while the different districts are foolishly allowed, as at present, to make their own regulations as to the tenure of claims, it is useless to talk of the accumulation of any mining fund from this source. The bullion tax has been abolished, with other taxes on internal manufactures, and could not be renewed, even for the purpose of benefitting the mines, without injustice.

There remains, therefore, only the sales of mineral lands as a source of revenue for such a purpose. The sums derived from such sales hitherto have been quite insignificant; but wise legislation for the encouragement of mining may increase them hereafter; and we firmly believe that to devote these sums to the work of such encouragement will be the best possible use the Government could make of them. It is not a question of appropriating a certain amount of money already in the Treasury. The money is not only not in the Treasnry now; but under the present administration of the mining law it never will be. Speculators are ravaging the public domain; and, believing themselves already clothed as squatters with all the rights of proprietors, they laugh to scorn the feeble invitation of the United States, that they should buy what they have without buying. Only under an improved legislation will the sale of the mineral lands be at all remunerative; and a part of such necessary improvement is the use of the proceeds of sales to encourage mining.

Now, shall the money received for the sale of mines be loaned to any great mining work whatever? There is no question but the Sutro tunnel deserves such aid if anything in the country does. Mines which have produced over a hundred millions already need the tunnel to continue their operations. The case is unique in our history, and finds analogy only in some of the ancient mining districts of other lands, where such deep tunnels have been completed by Government aid. No new and undeveloped region, no purely speculative prospecting tunnel, could have any such claims. We have repeatedly discouraged the prospecting of vaguely-known metalliferous belts by cross-tunnels. In the majority of cases such enterprises come to grief, for reasons which every engineer understands. Long, deep cross-tunnels should only be run to connect with old and well-known productive mines. This is exactly the case with the Sutro tunnel; and scarcely another mining district on this continent presents the same features.

Now, our preference as to the application of funds to encourage mining industry is for a national school of mines, the distribution of information, and the speedy completion of land surveys, over all other methods whatsoever. But, if Congress shall decide to begin by assisting the Sutro tunnel, we shall not complain. Nor shall we consider that a dangerous precedent has been established for the future appropriation of funds; for the Comstock Lode is a precedent not likely, alas! to occur again in our history. Moreover, if any new Comstock should be developed by American enterprise, the experience of this one would, we trust, warn its owners to avail themselves betimes of the advantages of a deep tunnel, without waiting for a future SUTRO to undermine their superficial operations.

The Reese River Process.

THE following description of the METTACOM mill in Reese River district, taken from advance sheets of Commissioner RAYMOND'S second report, possesses general interest. The mill in question is not now running, the Manhattan company, by their exclusive control of the STETEFELDT furnac in that district, having overpowered all competition, and monopolized the business of reducing Reese River ores:

"The best mills using the Reese River process of dry crushing, roasting, and amalgamation are probably the Manhattan, at Austin, and the Mettacom, in the same district, about a mile from Yankee Blade. The latter mill is, in many respects, unsurpassed in the country; and I was so impressed with the excellence of its general plan and arrangement, and with the skilful manner in which it was operated, when I examined it in 1868, that I have chosen it as the basis of a minute description and discussion. I am indebted for detailed information to Mr. JOHN HOWELL, at that time superintendent, one of the most intelligent and experienced mill-men in Nevada.

"The Mettacom mill was erected in 1865–66 to work the ores of the mine of the same name belonging to the Mettacom company, and owned, I believe, principally in New Jersey. Like all the narrow veins of the district, the Mettacom was not able to furnish ore enough to occupy the mill. In fact, though a great deal of rich ore has been from time to time obtained and reduced, regular and extensive stopes have never been opened; and the great cost of dead-work in shafts and drifts has doubtless exceeded all returns. For the year ending July 1, 1869, the mill has not made regular runs; but since that time it has been running on ore from the Lane and Fuller mine, on Lander Hill.

"The mill contains ten stamps, in two batteries of five each. This number of stamps is generally considered to be the best. As the stamps at the end of a mortar do less work than the others, the more there are in one mortar the better the average work; but six would be too many, on account of the necessity of greatly increasing the diameter of the cam-shaft to prevent its springing. Many mill-men believe that five stamps, dropping in proper order, produce the best "wave" or "splash" of discharge through the screens; but this opinion refers only to wet crushing.

"The weight of the stamps is nearly 900 pounds each. There is not so much difference of opinion now as formerly among good mill-men as to the proper weight for stamps. As the amount of horse-power (and hence of fuel) required to run a battery depends directly upon this weight, it has been necessary to find out by experience whether heavy blows do as much work in proportion as lighter ones, and where the proper medium lies. The question has quite as much to do with the discharge as with the crushing. The blow of the stamp not only pulverizes the rock, but drives it outward through the screens. In dry stamping this is the only force which effects the discharge. Hence, the weight of the stamp should not be so great as to necessitate slow running. Probably 750 to 800 pounds is the best weight for general use; though, if all mills were run as skilfully as the Mettacom, even 900 pounds would not be too heavy.

"The stems are 3½ inches in diameter. The usual size is 2½, and these stems are, therefore, nearly 20 per cent. stronger and heavier than ordinary; the proportion being as the squares of the diameters. The advantage of putting a larger proportion of the total weight into the stem is the diminished vibration from the blow on the tappet. The stems should always be fitted as closely as possible to the guides; but light stems spring or bend, and wear the guide in rising. There is no wear of this kind in falling, so long as the stem is true. The stems are set 8½ inches apart, the bosses and shoes work within about two inches of each other, and the distance between the tappets is about three-fourths of an inch. The whole length of each battery-mortar is therefore about 5 feet 6 inches.

"The cam-shaft is rigged with single cams. The old fashion of triple cams is now about obsolete; but the usual form is the double cam, which many mill-men still prefer, claiming, that as it gives two drops of the stamp for each revolution, it saves friction in gearing, and enables the battery to be run at high speeds, without running the engine as fast. These and other arguments for the double cam only prove that it suits the machinery which has been calculated for it. As a matter of fact, however, I have never seen double-cam batteries equal the single cams in speed; and I think Mr. HOWELL is right in claiming the advantage for single cams, that the shoulder can be brought directly under the tappet, so as to prevent catching. With the ordinary double cam, the shaft must be set further back from the stems, and the cams are easily caught and broken.

"This subject is directly related to the speed of the battery. The Mettacom mill has vindicated triumphantly the wisdom of its peculiar features by the most extraordinary running on record. For months together the batteries have been kept at from 98 to 100 drops per minute, rising to 102, or even 105, and never falling below 94; yet there has never been a cam broken in the mill. The Manhattan, an excellent mill, with double cams and stamps weighing only 750 pounds, cannot safely run on the same ore at higher speed than 85 to the minute, and Mr. CURTIS, the able superintendent with the performances of the Mettacom before his eyes, naturally declares himself in favor of the single cam, which would enable him to run his batteries up to 110 per minute. The Mettacom stamps fall 10 inches. The original drop was 9½ inches; but it was increased to ease the cams and give less jar. The rebound of the stamps amounts sometimes to 1½ inches. Strange to say, the high speed maintained has not caused excessive necessity of repairs. On the contrary, the battery has stood the strain better than any other within my knowledge. Even the shoes and dies, which were not supposed to be unusually good, being bought for ordinary hard iron, lasted for five months of continuous running without being replaced. This fact cannot be adequately explained. Probably that particular set was a lucky cast. Ordinarily, it would have worn out in about six weeks; but I do not doubt that the heavy charges put through the batteries at high speed protected the shoes and dies from pounding on one another, which they are quite likely to do in ordinary mills, especially when the feeder is careless. A mill running at 100 to the minute keeps the feeder busy; and he does not wait for a stamp to thunder out, by pounding on its anvil, that it has finished its last mouthful and wants another.

"A fact not to be overlooked in this connection is the great solidity of the battery frame and foundations. Nine-tenths of the stamp-mills ordinarily erected would rack themselves to pieces, if run as the Mettacom has been, without breaking so much as a bolt.

"The gain in quantity of ore crushed is more than proportionate to the increase of speed. As I have remarked, this quantity depends, in dry-crushing especially, on the discharge. I shall speak of that presently, as it regards the arrangement of screens; but I now refer to the frequency of the drops which supply the direct impulse and the air shock, by which the dry 'pulp' is driven through the screens. Mr. HOWELL found by experiment that with 60 drops per minute he could put through in twenty-four hours only about 4½ tons; 90 drops gave a little over 10 tons; and 102 drops more than 15½ tons. If we assume that the increase in consumption of fuel would be the same as that in the power generated by the falling stamps per minute, we shall have:

No. of drops per minute.	Horse-power, per stamp.	Increase of power.	Yield.	Increase of yield.
60	1.36	.....	4½	.....
90	2.04	50 per cent.	10	122 per cent.
102	2.22	10 per cent.	15½	55 per cent.

"The increase of speed from 60 to 102, or 70 per cent., increased the yield from 4½ to 15½, or 244 per cent. To this should be added the gain in wages, interest on capital, etc., secured by rapid running. This comparison does not fairly apply to wet-crushing, though I am satisfied that in that process also high speeds are the best. But the difference is not so startling. Most wet-crushing mills come pretty near the average of 1¼ tons crushed in twenty-four hours per horse-power developed by each stamp. But the above table shows a variation from 0.33 tons at 60 to 0.70 at 102. The performance of the Manhattan mill is about 0.45 tons crushed in twenty-four hours per horse-power developed by each stamp; and this is a fair, perhaps a high, average for such mills.

"When the throat of the battery is open, the pulp will be thrown both ways, and some of it comes back on the feeding floor. This indicates a fact too often ignored in the construction of mortars, namely, that since the impulse given by the stamp is radial in all directions, the greater the surface of discharge, the higher will be the duty performed. The Mettacom batteries are not perfect in this respect. They have only single front discharge, but this is eighteen inches high, instead of twelve, as is usual. It is noticed that the [illegible]

mostly through the upper six inches, and hence, in most batteries, would be thrown back into the mortar until it found exit below. Various forms of mortar with increased discharge have been recommended. The maximum discharge per stamp is attained by Clayton's circular mortar, containing only one stamp. There are also mortars with universal discharge, in which the screens go all the way round, being curved at the ends. The most common are the double dischargers, having screens in front and behind, and the feed over the rear screen. The objection hitherto made to all arrangements involving curved screens, is the difficulty of properly stretching and keying them, while in dry crushing, even a rear screen is found to be inconvenient on account of breakage from coarse ore. Mr. CURTIS, of the Manhattan, however, prefers a double discharge, while Mr. HOWELL cares more for end-discharges. The Mettacom end-stamps are hung with three-eighths of an inch more fall than the others, and still do less work. The order in which the stamps fall varies in different mills, and for wet and dry crushing. The two extremes to be avoided are a simultaneous drop of all the stamps, which would rack the frame, strain the engine, destroy the continuity of discharge, and probably break the screens, and a drop in regular succession, (1, 2, 3, 4, 5,) which would shove the ore to one end of the mortar, and give the stamps at one end too much, and at the other end too little to do. Some millmen prefer to arrange the succession so that no stamp shall immediately follow its next neighbor. The orders 1, 4, 2, 5, 3; 1, 3, 5, 2, 4; 4, 2, 5, 1, 3, would satisfy this condition. Others prefer dropping the two-end stamps first, as 1, 5, 2, 4, 3, or 1, 5, 4, 2, 3. The wave of discharge or splash of the water through the screens in wet-crushing is to be taken into consideration. In dry-crushing the objects to be secured are an equal distribution of ore under the stamps, giving an equal work per stamp, and a maximum discharge of pulp through the screens. The latter seems to be best secured by letting the middle stamp drop last. The outer stamps should then have slightly longer cams, to increase their fall. It will be found that the central stamps take and distribute nearly all the feed. Much depends on the skill and fidelity of the feeder, in both kinds of crushing. Hence automatic self-feeding batteries used in Cornwall have found little favor in this country. They do not 'humor' the stamps; and the difference in regularity of running and in duty performed, is more than equivalent to the wages of a good feeder.

"The screens of this mill are No. 40, brass wire (1,600 meshes to the square inch), which is preferred for dry crushing to the 'Russia punched.' The latter are frequently preferred by mill-men in wet crushing, on account of alleged greater durability, or in the belief that slits are better adapted to discharge liquid pulp than meshes. I take leave to doubt, however, whether these discharges in any case counterbalance the greater proportional discharge-area offered by wire screens. The Mettacom screens are not vertical, but lean outward about 10 degrees. The pulp generally goes through obliquely, and is as fine as the siftings of a horizontal No. 60 sieve. The angle given has been est ablished as the best for dry crushing. The gain, in amount of discharge, wet or dry, from inclined screens, is universally recognized; but mill-men do not so generally bear in mind that the screen so set should be a little coarser than the fineness required for the pulp, if the best results are to be obtained. Mr. HOWELL'S observation is that stamps ordinarily crush faster than the batteries discharge. He has often put the pulp back through his battery, and found it took about as long to go through as fresh rock. Running slow gives the fine dust a chance to fall back under the stamps; running fast keeps it constantly in motion, and much of it gets out. I venture to suggest some considerations based upon the foregoing facts, and calculated, I think, to put millmen upon the right track in increasing the efficiency of dry batteries. It seems to me that dropping 900-pound stamps is a costly way of making currents of air to promote discharge.

"The object of the mill-man should be to get the highest practicable speed from his stamps, and then to give them such facilities for discharge as that every drop shall do its full work in crushing. The increase of the discharge area is the first and most obvious means, and a useful auxiliary will, I think, be found in producing a current of air with a fan, which shall suck or drive the fine dust through the sieve. I have seen exhausting fans applied in this way in several mills. There was one in the Sheba, at Star City, Humboldt county, and there were several in the early Austin mills, which were finally condemned. Mill-men are too ready to reject such appliances as soon as they cause a little trouble, whether through faulty construction or careless management. But this point will be found too important to be dismissed so easily. I do not remember ever in my life seeing a stamp-mill in which the difficulty of discharge did not really delay the work of crushing. The extreme of excessive discharge, which would do no harm, is carefully avoided, and no one can tell to this day how much the stamp now in use could be made to do, by simply improving batteries in this respect. The tide of invention is, it appears to me, running the wrong way. We have innumerable devices to increase the force and efficiency of the blow of the stamp, which is already in advance of the rest of the machinery, while the inventions for improving the mortars and discharges are few, generally imperfect, and regarded with too little favor by those practical mill-men who are alone competent to take hold of them and perfect them.

"The screens at this mill last nearly four weeks. When the threads wear thin they begin to shift, and the screens must be removed. They are turned to prolong the wear. The middle of the screen lasts longest. The dies, when new, come up to within about one inch of the lowest portion of the discharge. It is very important to make this interval, called the 'height of issue,' as small as the screens will bear. The dies used for five months wore away about 1½ inches, and the introduction of new ones raised the capacity of the battery nearly two tons per day. Much trouble was experienced in keeping the dies in their places in the bottom of the mortar. Finally 150 pounds of melted lead was poured in, filling the mortar-bed about one inch. This is found to work well. I think that for dry crushing a single die, filling the whole bed, would be better yet. When it wears on one side it can be turned, and so used till it is worn out. This is a German plan, and used successfully in some dry-crushing mills managed by Germans in this country.

"The foundation of a battery is the most important part of its construction, and it is the feature most neglected in this country. Few mill owners like to put so much money 'out of sight;' the work of preparing foundations is parsimoniously, ignorantly, or carelessly managed; and the result is that the batteries cannot be run at high speed, and even at low speed they are continually settling, or getting out of line. The great efficiency and stability of the Mettacom mill is due to its carefully-prepared foundation. The mortar-blocks are set on end, upon solid bed-rock. They are nine feet deep. Before placing them the rock was thoroughly smoothed and levelled, and the bottom of each block was planed true. The upper ends of the blocks being (as is the case with all large timbers) sun-cracked, melted sulphur was poured into the cracks. The mortars are set on the blocks and screwed down tight. If screwed (as is frequently the case) directly to the blocks, they will in a few months get loose, and rock and sand will work between, putting the machinery out of plumb and endangering the mortar. To prevent this, two thicknesses of blanket soaked in tar were put between the mortars and the blocks. An arrangement was made by which the settling of the mortars could be measured. It is found that after more than a year of steady running, they have sunk uniformly less than one-fourth inch—doubtless due to the compression of the blankets. The freedom from jar in the mill, while the batteries were running at tremendous speed, impressed me as decisive proof of the utility of the arrangements described. There is, however, some vibration in the cam-shaft, which should have be en five inches instead of four in diameter. Mr. HOWELL recommends also heavy bearings. The latter are now eight inches, and should be ten. No Babbitt metal is used in the upper box; it cannot be kept in, and smooth iron is therefore preferred. The battery, running at 98 to 100 per minute, requires about twenty-two horse-power, which is perhaps a little more than half the power employed in the mill, and crushes easily seven tons in twelve hours. This being about the usual duty for twenty-four hours, the rest of the mill, especially the reverberatories for roasting, calculated on that basis, cannot come up to the capacity of the battery; and this great defect in the original plans has never yet been remedied. I have frequently found mills in which the capacity of the roasting or amalgamating apparatus is quite unsuited to that of the batteries. In such cases the extra machinery is practically good for nothing, since the capacity of a mill is determined by its least adequate part. The Mettacom batteries must either run but twelve hours daily, or they must run for a longer period at full capacity, and then stand still until the surplus of pulp has beeen roast ed.

"The roasting department is also very expensive. It compares unfavorably in this respect with some other mills on the same plan, to say nothing of the difference between all reverberatories and the Stetefeldt chloridizing furnace. The pulp from the batteries is deprived of all moisture by drying with heat from the roasters. Of these there are four, in the English style. They have eighty-four square feet each of stirring surface, and very low arches. I will not pause here to discuss the proper form for reverberatories to be used in this process, as they are likely to be soon superseded altogether. The shape most common in Central Nevada was adopted at hap-hazard, and the excessive lowness of arch frequently met with is doubtless a defect, as it brings the reducing influences of the flame too closely upon the body of the ore. The building is wide enough for stirring and for cooling floors. Contracted mill-buildings are not economical. They embarrass workmen, especially at the furnaces, and increase the expense of handling ore. Salt is charged with the ore, and during the process, to the amount of ten per cent. The roasting charge is 1,000 pounds, and a complete operation requires about seven hours. The four furnaces treat, on an average, six and a half tons of ore daily, each consuming one cord of wood, and all four requiring the labor of twelve men.

"Amalgamation is performed in "Freiberg barrels." The question of superiority between barrels and pans has not yet been definitely settled, and probably the true answer will differ with circumstances. The pan is virtually an American invention; American workmen are more familiar with its use, and American manufacturers are greatly interested in maintaining it. Moreover, the pan is a part of the Washoe process, in which most of our silver mill-men were primarily trained, and for which it appears to be well fitted. On the other hand, I do not think that barrels have had a fair trial. All inconveniences which attend them can be measured in money, and may possibly be more than compensated by the cheapness and incomparably smaller expense of repairs for renewals, involved in the use of barrels. The barrel works for ten tons per day will cost:

Six barrels, at $200	$1,200
Three settlers, at $180	540
Gearing and machinery	300
Total, exclusive of power	$2,040

"The economy of the process, as conducted at the Mettacom mill, is satisfactory. There are ten barrels, 5 feet by 4 in the clear, taking each one ton at a charge, and making 16½ revolutions per minute. The quantity of quicksilver employed varies with the value of the ore. For $200 ore, 400 pounds of quicksilver are kept in each barrel. As the wood of the barrel remains neutral, it is necessary to keep iron scraps in the barrels to effect the required reactions. For this purpose, about 200 pounds of wrought-iron (much better than cast-iron) are put in each barrel when the works are started, and the quantity is maintained by replenishment as fast as it is consumed. The pulp from the roasters, in which the silver has been chlorodized, is mixed with hot water to the consistency of a thin curd, and introduced into the barrels through the large square bungs, which are tightly closed, and the barrels set in revolution. For two hours no quicksilver is added. During this period the iron absorbs the excess of chlorine from the ore. After this, the iron looks bright; the quicksilver is added, and in about three hours amalgamation is in full progress. The revolution is continued over eight hours longer, when cold water is added till the barrel is full; the barrel is revolved fifteen minutes, and finally discharged into a settler. The duration of the amalgamation for one ton is therefore about fourteen hours. There are two barrels to each settler. The settlers have 6 feet diameter and 3 feet depth. They are provided with wooden arms, revolving about 2 inches from the bottom. The collection, retorting, etc., are performed in the usual manner.

"The barrel staves are at first 6 inches thick. They are now worn in places about 1½ inches. The present barrels cost $200 each, and have been running four and a half months. They have been counted good with repairs for four months longer, when they can be mended, at a nominal cost, by lagging them up inside, so as to make them in reality last an indefinite time. They are run with friction wheels, and consume less than two-horse power each. The bullion from pans is generally finer, and melts with less dross and slag. But the results of these barrels, in point of amount of silver extracted, as compared with the assay, are equal, I think, to those of pans.

"The power for driving stamps, barrels settlers, etc., is furnished by an engine of about 60 horse-power, run at 40 to 45; steam pressure, 55 to 60 pounds. Steam is supplied by two 16-feet tubular boilers, 44 inches in diameter, and containing 42 tubes each. The steam cylinder has 14 inches diameter and 30 inches stroke. There is an 18-feet fly-wheel, weighing 4,500 pounds.

"The following statements show the cost of the different operations:

ACTUAL COST OF POWER.

2 engineers, $6 and $5 50 per day	$11 50
4½ cords of wood, at $10	47 50
Repairs and oil	5 00
Cost of power, per day	64 00

COST OF CRUSHING.

Power, (batteries require about half the power)	$32 00
2 men to break rock and feed, $4 50 and $4	8 50
1 man to clean battery and help them	4 00
Average daily repairs	3 00
Total daily expense of batteries	47 50
Average daily crushing, 13 tons; cost per ton	3 65

COST OF ROASTING.

11 men, at $4	$44 00
1 foreman, at $5 50	5 50
4 cords of wood, at $10	40 00
Salt, 10 per cent. on 6½ tons, 0.65 tons, at $45	29 25
1 cooler, (also employed at the barrels charge half-time) at $4	2 00
Repairs and incidentals	8 00
Total daily expense of furnaces	128 75
Average roasting per day, 6½ tons; cost per ton	19 80

(The average cost at the Manhattan is said to be only $15.)

COST OF AMALGAMATION.

Power, (half the power of engine)	$32 00
Old wrought iron, 100 pounds daily, at $2 50	2 50
3½ men, at $4	14 00
Loss of quicksilver, 2 pounds per ton	13 20
Repairs	2 00
Light and oil	2 00
Total daily expense of barrels	65 70
Average daily amalgamated, 10 tons; cost per ton	6 57

RECAPITULATION.

	Per ton.
Cost of crushing	$3 65
Cost of roasting	19 80
Cost of amalgamating	6 57
Retorting and melting	1 00
Total cost of treatment	31 02

"The cost of treatment of chloride ore, unroasted, would be:

	Per ton.
Crushing, about	$3 50
Amalgamating	6 57
Retorting and melting	75
Total	10 82

"The Mettacom Mill could be in several particulars considerably improved; but, taken as a whole, I do not know of any other that can surpass the record of efficiency and economy thus furnished by the actual averages of prolonged working. If the Metttacom reverberatories were as good as those of the Manhattan, the cost of treatment, including roasting, would be only $26 22. The use of the Stetefeldt furnace would probably reduce it to $21 22. These figures are thus proved not to be mere wild theory; and the mining industry of Central Nevada will not thrive until they are put in practice.

"The superiority of the Mettacom batteries led the proprietors of the Lane & Fuller mine, at Austin, to lease this mill, and finally, I believe, to purchase it, though there were, at the same time, half a dezen standing idle nearer to their mine. A success so marked deserves even more detailed examination than I have given it. But I hope I have said enough to arrest the attention, and arouse the emulation of practical experts, for whom, chiefly, this chapter has been written."

An Elastic Preparation of Glue.

DR. SONNENSCHEIN reports (*Polytechniches Journal*) that when a thick solution of glue is mixed with tungstate of soda and hydrochloric acid, there is precipitated a compound of tungstic acid and glue, which, at from 30° to 40° C., is sufficiently

elastic to admit of being drawn out into very thin sheets. On cooling, it becomes solid and brittle; but when heated, it again becomes soft and plastic. It appears that this material has been successfully employed instead of albumen in calico-printing, in order to fix the aniline colors upon cotton; it is also used in tanning, but the leather becomes as hard and stiff as a plank of wood. It is recommended as a lute or cement.

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110,546.—BRIDGE.—Alexander McDonald Campbell, Newark, N. J., assignor to himself, Charles M. Bolen, and Frederick K. Day.
110,547.—ANNUNCIATOR.—Jacob Capron, New York, N. Y.
110,548.—CULTIVATOR.—Joseph H. Carlow, Kidder, Mo.
110,549.—COTTON-PRESS.—Nash Cheek, Chapel Hill, N. C.
110,550.—PLOW.—Josiah Clifton, Georgetown, Texas.
110,551.—CLOTHES-DRIER.—Emmons B. Corby, Bloomfield, N.J.
110,552.—TRUNK.—Frederick K. Daggett, Boston, Mass.
110,553.—PREVENTING INCRUSTATION OF STEAM BOILERS.—Charles James Adolph Dick, Paris, France.
110,554.—LAND-ROLLER.—James W. Dilley, Macomb, Ill.
110,555.—WASHING-MACHINE.—William James Dodge, Syracuse, N. Y.
110,556.—DRAWING-FRAME.—George Draper, Hopedale, Mass.
110,557.—FASTENING CARRIAGE-WHEELS.—Wilson Elder, Mill Hall, Pa.
110,558.—CARRIAGE-BUTTON.—Charles H. Field, Providence, R. I.
110,559.—DISH-WASHER.—Ruth Filson, Robert D. S. Filson, and John D. Cope, Xenia, Ill.
110,560.—PERMUTATION-LOCK.—Charles Flesch, Rochester, N.Y.
110,561.—CHILD'S CARRIAGE.—Isaac Newton Forrester, Bridgeport, Conn.
110,562.—TREATING HIDES AND MANUFACTURING LEATHER.—William H Fuller, Brockport, assignor to himself and Gilbert J. Kingsbury, Rochester, N. Y.
110,563.—CAR-WHEEL.—William Goodman, Boston, Mass.
110,564.—APPARATUS FOR RAISING VESSELS.—John Emery Gowen, Boston, Mass.
110,565.—HAND CORN-HUSKER AND SHELLER.—James Madison Gray, Louisville, Ky.
110,566.—COOKING-RANGE.—William Hall, Quincy, Ill.
110,567.—METAL ROOF FOR BUILDINGS.—John S. Haywood, Rochester, Minn.
110,568.—HARVESTER.—George F. Hawley, Grand Rapids, Mich.
110,569.—MECHANISM FOR OPERATING SEWING-MACHINES.—Elijah Leavitt Howard, Malden, assignor to George Augustus Whiting, Charlestown, Mass.
110,570.—HAT.—George Johnson, Philadelphia, Pa.
110,571.—SLEIGH.—Alvarado Jones, Randolph, Wis.
110,572.—TRACE-BUCKLE.—William W. Kittleman, Bloomfield, Iowa.
110,573.—MACHINE FOR COOLING AIR, AND FOR THE MANUFACTURE OF ICE.—Julius Kraffert, Hoboken, N. J.
110,574.—FELTING MACHINE.—Calvin P. Ladd, New York, N. Y., assignor to himself and James T. Sanford, same place.
110,575.—TRUNK.—John G. Lane, St. Louis, Mo.
110,576.—CURRY-COMB.—William E. Lawrence, New York, N.Y.
110,577.—IRONING-TABLE.—John Jacob Marki, Chicago, Ill., assignor to himself, William H. Lotz, and Carl Beer, same place.
110,578.—FOLDING LOUNGE.—Michael Marso, Chicago, Ill.
110,579.—AXLE-SKEIN.—Lorenzo Mayhew, Saratoga Springs, N. Y.
110,580.—CAR-COUPLING.—William Henry Meadows, McMinnville, Tenn.
110,581.—CARRIAGE-CLIP.—Francis B. Morse, Plantsville, Conn., assignor to himself and H. D. Smith & Co., same place.
110,582.—MATERIAL FOR BEARINGS AND PACKINGS.—Eliza D. Murfey, New York, N. Y., assignor to the Manhattan Packing-Manufacturing Company, same place.
110,583.—BEARING AND PACKING MATERIAL.—Eliza Dexter Murfey, New York, N. Y., assignor to the Manhattan Packing-Manufacturing Company, same place.
110,584.—THE MANUFACTURE OF MATERIALS FOR JOURNALS, BEARINGS AND PACKINGS.—Eliza D. Murfey, New York, N. Y., assignor to the Manhattan Packing-Manufacturing Company, same place.
110,585.—HAY AND OTHER PRESSES.—Moses V. Northrup, Hornitos, Cal.
110,586.—MACHINE FOR DRESSING FENCE-PICKETS.—William Nuelle and Joseph F. Nuelle, St. Louis, Mo.
110,587.—FINGER-RING.—John S. Palmer, Providence, R. I.
110,588.—COOKING-STOVE.—Miles Pratt, Watertown, Mass.
110,589.—BROILER AND TOASTER.—Josiah M. Read and John M. Smith, Boston, Mass.
110,590.—SHAFT-COUPLING.—Peter W. Reinshagen, Cincinnati, Ohio, assignor to himself and John H. Buckman, same place.
110,591.—LAMP-WICK.—Daniel T. Robinson, Boston, Mass.
110,592.—LAWN-MOWER.—Luther Ross, Worcester, Mass.
110,593.—CORSET-FASTENING.—Christian Schieck, New York, N. Y.
110,594.—TOBACCO-PIPE.—William Selfe, Cincinnati, Ohio.
110,595.—SEED-SOWER.—Samuel H. Sheplar, San Francisco, Cal., and William G. Conklin, Portland, Oregon.
110,596.—CARPENTERS' GAUGE.—Henry P. Sisson, Rutland, Vt.
110,597.—COMBINED TRAMWAY AND PAVEMENT.—Barzillai C. Smith, Burlington, N. J.
110,598.—CHAIR-FRAME.—William Merion Smith, Columbus, Ohio.
110,599.—PORTABLE SHIELD FOR INFANTRY AND ARTILLERY.—Hardo Spears, Snow Hill, Cal.
110,600.—LIFE-BOAT.—James M. Starr, Fond Du Lac, Wis.
110,601.—MALT RESERVOIR.—Charles Stoll, Brooklyn, N. Y.
110,602.—SAFETY ATTACHMENT FOR RAILWAY TRUCKS.—Arnold Strauss, New York, N. Y.
110,603.—POCKET-BRUSH.—Theodore F. Stumpf, New York, N. Y.
110,604.—STEAM-BOILER.—Frederick Sulter, Cleveland, Ohio.
110,605.—GRAIN-REGISTER.—William Z. Taylor, Burlington, assignor to himself and John R. King, same place.
110,606.—CARRIAGE.—Chauncey Thomas, Boston, Mass.
110,607.—CLOTHES-DRIER.—William Tredenick, Providence, R. I.
110,608.—PEPPER AND SPICE-BOX.—A. E. Turnbull, Jr., Clifton, Ohio, assignor to Joseph H. Steele, New Haven, Conn.
110,609.—MACHINE FOR CUTTING AND SHAPING METALS.—Claus Van Haagen, Philadelphia, Pa., assignor to himself and Anthony Van Haagen, same place.
110,610.—COMPOUND FOR TREATING LEATHER.—Samuel S. Walbank, Superior City, Wis.
110,611.—TAP FOR OIL PACKAGE.—Albin Warth, Stapleton, N.Y.
110,612.—TAP FOR OIL PACKAGE.—Albin Warth, Stapleton, N.Y.
110,613.—GRAIN-RAKE.—Marcus M. Wells, Hartwick, N. Y.
110,614.—WATCH-REGULATOR.—Charles V. Woerd, Waltham, Mass.
110,615.—FUR-SET BOX.—Clinton W. Frazer, Brooklyn, N. Y.
110,616.—CHURN.—Joseph O. Maclaskey, Perth Amboy, N., assignor to himself and James E. Tyrrell, same place.
110,617.—FLIER FOR SPINNING-MACHINE.—Theodore T. Abbott and John A. V. Smith, Manchester, N. H.
110,618.—MOLE-TRAP.—John Adams, Greencastle, Ind.
110,619, antedated December 21, 1870.—STONE-DRAG.—Elijah C. Allen, Deerfield, Mass.
110,620, antedated December 29, 1870.—SEEDING-MACHINE.—Asher S Babbit, Keesville, N. Y., assignor to Babbit, Hinckley & Co., same place.
110,621.—FETTER OR CLOG FOR FOWLS.—Sanford J. Baker, Madison Centre, Me.
110,622.—PUMP.—Joel R. Bassett, Cincinnati, Ohio.
110,623.—MACHINE FOR MARKING SQUARES.—Charles S. Bement, Southington, assignor to Hart Manufacturing Company, Kensington, Conn.
110,624.—CUTTER FOR NAIL-CUTTING MACHINES.—Eleazar Bless, Indianapolis, Ind.
110,625.—SHOT-CASE AND DISTRIBUTER.—Sinclair Booton, Seguin, Texas.
110,626.—COMPOUND FOR CULINARY USE.—Henry W. Bradley, Binghamton, N. Y.
110,627.—RENDERING AND TREATING OFFAL AND OTHER ANIMAL SUBSTANCES.—Duncan Bruce, Brooklyn, N. Y., assignor to Emma Bruce, same place.
110,628.—PAINT-BRUSH.—William B. Burtnett, New York, N. Y.
110,629, antedated December 30, 1870.—HOG-SNOUTER.—John C. Campbell and Warren S. Bruce, Good Hope, Ill.
110,630.—PILL-MACHINE.—Pierre Cauhape, New York, N. Y.
110,631.—PAPER-CUTTING MACHINE.—John E. Coffin, Portland, Me., assignor to Frederick W. Bailey and James Noyes, same place.
110,632.—BEDSTEAD-FASTENING.—Charles S. Comins, Lowell, Mass.
110,633.—FASTENING FOR EAVES-TROUGHS.—Leonard Cook, Shreveport, La.
110,634.—SEEDING-MACHINE.—Jackson Cozad, Corydon, Iowa.
110,635.—FLOUR-BOLT.—Robert W. Cunningham, Chesterville, Ohio.
110,636.—COTTON-PLANTER AND MANURE-DISTRIBUTER.—Nimrod Donaldson, Line Creek, S. C.
110,637.—REVERSIBLE LATCH.—Heinrich Dotzenroth, Pittsburg, Pa.
110,638.—REFINING PETROLEUM.—Richard Eaton, Montreal, Canada.
110,639.—PROTECTING THE HEARTHS OF FURNACES.—Henry William Ellicott, Baltimore, Md.
110,640.—LOOM.—Robert Elliott, Chester, Pa.
110,641.—VENTILATOR.—William Ennis, Philadelphia, Pa.
110,642.—DOVETAILING-MACHINE.—Harry E. Evarts, Chicago, Ill.
110,643.—ALARM FOR LOCOMOTIVE ENGINES.—Reed A. Filkins, North Adams, Mass.
110,644.—COMBINED COTTON-SEED PLANTER AND GUANO-DISTRIBUTER.—Lafayette Gantt, Camilla, Ga.
110,645.—GLASS TELEGRAPH-INSULATOR.—John Garity, East Birmingham, Pa.
110,646.—GATE.—Robert Gidley, Lagrangeville, N. Y.
110,647.—HAND-HOLE CAP FOR STEAM BOILERS.—William W. Graham, Boston, Mass., assignor to himself and James S. Parsons, Windham, Conn.
110,648.—LAMP.—Franklin T. Grimes, Liberty, Mo.
110,649.—CLOTHES-PIN.—George Alfred Harris, Buchanan, Mich.
110,650, antedated December 23, 1870.—SAW-SET.—Henry A. Centre, Texas.
110,651, antedated December 30, 1870.—FOLDING LAMP-SHADES. Henry M. Hartshorn, Malden, Mass.
110,652.—COMPOSITION FOR PRESERVING WOOD.—William Hayman, Taunton, Mass., assignor to himself and William R. Black, same place.
110,653.—RECLINING AND ROCKING-CHAIR.—Samuel Hayward, Boston, assignor to himself and Luther E. Kimball, Cambridgeport, Mass.
110,654.—BASE-BURNING FIRE-PLACE HEATER.—Elisha S. Heath, Baltimore, Md.
110,655, antedated December 24, 1870.—DROP-HAMMER LIFTER.—Francis M. Hodge, Shelburne Falls, Mass.
110,656.—KNITTING-MACHINE.—William H. H. Hollen, Fostoria, Pa.
110,657.—CALIPER.—William P. Hopkins, Lawrence, Mass.
110,658, antedated December 20, 1870.—THRASHING-MACHINE.—Hiram E. Hurlburt, Hammondsport, N. Y.
110,659.—DOUBLE HINGE.—John S. Jenness, Bangor, Me.
110,660, antedated December 31, 1870.—SUBSOIL PLOW.—Marquis R. Jones, Walworth, Wis.
110,661.—MILKING-STOOL.—Richard W. Jones and John B. Baker, syracuse, N. Y.
110,662.—APPARATUS FOR THE MANUFACTURE OF BROMINE.—John J. Juhler, Natrona, Pa.
110,663.—RUT-LEVELLER.—Calvin Marshall, North Easton, Mass.
110,664.—HOT-AIR FURNACE.—Peter Martin, Cincinnati, Ohio.
110,665.—COMPOSITION FOR ROOFING.—Jerome B. Melvin, Lowell, Mass.
110,666. antedated December 22, 1870.—PURIFICATION OF CAST IRON.—John W. Middleton, Philadelphia, Pa.
110,667.—MOTIVE-POWER APPARATUS.—Cassius A. Mills, Bridgeport, Conn.
110,668.—HOT-WATER FEEDER FOR STEAM BOILERS.—John H. Mills, Boston, and John Howarth, Salem, Mass.
110,669.—SEWING MACHINE FOR WORKING BUTTON-HOLES.—Eugene Moreau, San Francisco, Cal., assignor to himself, James W. Haggerty, and Samuel Hill.
110,670.—TUCKING DEVICE FOR SEWING MACHINES.—Aaron Morehouse, Hartford, Conn.
110,671.—SAW-TABLE.—Peter Neeb, Buffalo, N. Y., assignor, by mesne assignment, to Margaret Neeb.
110,672, antedated December 17, 1870.—FLOUR-SIFTER.—Lucy Sawyer, Templeton, Mass.
110,673.—WAGON-BRAKE.—Andrew Van Der Hyden Oliver, Bethlehem, N. Y.
110,674.—BELT-SHIPPER.—John L. Otis, Leeds, Mass.
110,675.—PRINTING-TELEGRAPH.—George M. Phelps, Brooklyn, N. Y., assignor to the Western Union Telegraph Company, New York City.
110,676.—SPARK-ARRESTER.—Charles L. Pierpont, Durand, Wis.
110,677.—LUBRICATOR.—William Pratt, Providence, R. I., and N. Bangs Williams, New York, N. Y., assignors to Abby A. Williams, Brooklyn, N. Y.
110,678.—CHURN.—James H. Reed, La Fayette, Ind.
110,679.—CORN-PLANTER.—John Reichelderfer, Cridersville, Ohio, administrator of Philip Kuntz, deceased.
110,680.—MANUFACTURE OF ACID PHOSPHATES FOR USE IN BAKING-POWDERS, &c.—Nathaniel C. Rice, East Saginaw, Mich.
110,681.—STEAM-ENGINE.—Thomas Ross, Rutland, Vt.
110,682.—CULTIVATOR.—Jacob Sattison, Ripley Township, Ohio.
110,683, antedated December 31, 1870.—WINDMILL.—Edvard Savoral, New York, N. Y.
110,684.—CASTING BAR-SOLDER.—Abraham Schoenberg, New York, N. Y.
110,685.—DIES FOR FORMING HORSE-COLLAR SHELLS.—John W. Schwaner, Egg Harbor City, N. J.
110,686.—SHUTTER-FASTENING.—Philip T. Share, Baltimore, Md.
110,687, antedated December 30, 1870.—GATE.—George A. Slater, Benton Harbor, Mich.
110,688.—SEED-DROPPER.—Hiram Moore Smith, Richmond, Va.
110,689.—PATTERN FOR MOLDING STOVE-LIDS.—Samuel Smith, Philadelphia, Pa., assignor to himself and Charles Noble & Co., same place.
110,690.—LUBRICATING COMPOUND.—Jacob H. Smyser, Pitts-Pittsburg, Pa.
110,691.—CLOTHES-DRIER.—Henry M. Stevenson, South Peacham, Vt.
110,692.—REVERSIBLE PLOWS.—George W. Thompson, Ripley, Ohio.
110,693.—EXTENSION PLOW-SHARE.—George W. Thorp, Columbus, Kansas.
110,694.—SEED-PLANTER AND GUANO-DISTRIBUTER.—Henry L. Tillery, Halifax, N. C.
110,695.—PRINTERS' FURNITURE.—Richard B. Topham, D. C.
110,696.—PLATFORM SCALE.—John H. Truex, Rochester, N. Y.
110,697.—FOLDING BEDSTEAD.—Joshua Turner, Cambridgeport, Mass., assignor to Benjamin A. Pettingill and Isaac S. Pear, same place.
110,698.—WHEELBARROW-FRAME.—Beckwith W. Tuthill, Oregon City, Oregon.
110,699.—PLAITING DEVICE FOR SEWING-MACHINES.—William Walker, Brooklyn, N. Y., assignor to George H. Wooster, New York City.
110,700.—ALARM-ATTACHMENT FOR MACHINES FOR FORMING HAT BODIES.—William C. Waring, Yonkers, N. Y.
110,701.—HEEL-TAP FOR BOOTS AND SHOES.—Alexander Warner, Brooklyn, E. D., N. Y.
110,702.—DRYING OIL-CLOTHS AND SIMILAR FABRICS.—Oliver C. Washburn, Philadelphia, Pa., assignor to Thomas Potter, same place.
110,703.—GOVERNOR FOR STEAM ENGINES.—Charles Waters, Boston, Mass.
110,704.—CONSTRUCTING MOLDINGS OF PAPER.—William W. Webster, Chelsea, Mass.
110,705, antedated December 17, 1870.—SAW.—Thomas Welham, Philadelphia, Pa.
110,706.—SEED-PLANTER.—William F. West, Haverstraw, N. Y.
110,707.—BAG-FILLING AND WEIGHING MACHINE.—Charles A. Whelan and Charles T. Wakeley, Madison, Wis.
110,708.—SAD-IRON HEATER.—Lewis Wilkinson, New York, N.Y.
110,709.—CHILDREN'S HOBBY-HORSE.—William L. Williams, New York, N. Y.
110,710.—APPARATUS FOR MAKING EXTRACTS FOR TANNING.—Riley P. Wilson, New York, N. Y.
110,711.—COVER AND TABLE FOR SEWING-MACHINES.—Francis R. Wolfinger, Chicago, Ill.
110,712.—GUIDING-WHEEL FOR HARVESTERS.—Walter A. Wood and William Anson Wood, Hoosick Falls, N. Y.
110,713.—HARVESTER.—Walter A. Wood, William Anson Wood, and John M. Rosebrooks, Hoosick Falls, N. Y.
110,714.—HARVESTER.—Walter A. Wood, William Anson Wood, and John M. Rosebrooks, Hoosick Falls, N. Y.
110,715.—HARVESTER.—Walter A. Wood, W. Anson Wood, and John M. Rosebrooks, Hoosick Falls, N. Y.
110,716.—HARVESTER-RAKE.—William Anson Wood, Hoosick Falls, N. Y.
110,717.—CAR-WHEEL MOLD.—William Ellison Worth, San Francisco, Cal.
110,718.—HARVESTER.—Charles M. Young, Meadville, Pa.
110,719.—MUSICAL NOTATION FOR ACCORDEONS.—Carl Friedrich Zimmermann, Philadelphia, Pa.
110,720.—SEEDING-MACHINE.—D. S. Alvord, Austinburg, and Charles D. Hollis, Ashtabula, Ohio.
110,721.—MEAT-CUTTER.—Jeremiah S. Artley, Danville, Pa.
110,722, antedated December 29, 1870.—IRON PLOW-BEAM.—Albert Ball, Canton, Ohio.
110,723.—CAR-REPLACER.—David H. Ball and John Brooks, Sinnamahoning, Pa.
110,724.—GRAIN-DUMPING CAR.—Leonard Bammerlin, Massillon, Ohio.
110,725, antedated December 30, 1870.—REIN-HOLDER.—William Barstow, San Francisco, Cal.
110,726.—CURTAIN-BRAKE.—Thomas S. Bailie and George H. Maurer, Washington, D. C.
110,727.—COATING AND DECORATING PAPER, CLOTH, AND OTHER MATERIALS.—Frederick Beck, New York, N. Y.
110,728.—SASH-HOLDER.—John H. Bloodgood, Bridgeport, Conn.
110,729.—GAS APPARATUS.—Abraham L. Bogart, New York, N. Y.
110,730.—SHUTTLE FOR SEWING-MACHINES.—Frederick W. Boland, New York, N. Y.
110,731.—HOT-AIR FURNACE.—Lansing Bonnell, Milwaukee, Wis.
110,732.—CIGAR-MOLD.—Nicholas H. Horgfeldt, New York, N. Y.
110,733.—FASTENER FOR MEETING-RAILS OF SASHES.—Elias K. Breckenridge, West Meriden, Conn.
110,734.—MANURE-FORK.—Amos S. Brinser and Henry Bricker, Falmouth, Pa.
110,735.—SEWING-MACHINE.—William H. Buker, Johnstown, N. Y.
110,736.—COMBINED CULTIVATOR AND PLANTER.—Peter Burress, Braidwood, Ill.
110,737.—HEMMER FOR SEWING-MACHINES.—Cyrus Carleton, Brooklyn, N. Y., assignor to Wilcox & Gibbs Sewing-Machine Company, New York City.
110,738.—PRESERVING WOOD.—Thomas W. Chandler, New York, N. Y., assignor to himself and Nicholas De Peyster, same place.
110,739.—SEWING-MACHINE FOR WORKING BUTTON-HOLES.—Sherman Cleminshaw, New York, N. Y.
110,740.—BINDER FOR SEWING-MACHINES.—Jacob L. Coles, Newark, N. J.
110,741.—AUTOMATIC CAR-COUPLING.—David Pitkin Crory, Cranford, N. J., assignor to himself and Josiah Crane, Jr., same place.
110,742.—HARVESTER.—William Robert Cory, Springfield, Ill.
110,743.—BOOT-JACK.—John Crabtree, Cincinnati, Ohio.
110,744.—CHILDREN'S CARRIAGE.—John C. Crandall, New York, N. Y.
110,745.—CHILDREN'S CARRIAGE.—William E. Crandall, New York, N. Y.
110,746.—RAILWAY-CAR SEAT.—William Crandell, Westfield, N. Y.
110,747.—DOOR FOR RANGES.—Royal E. Deane and Thomas Shedd, New York, N. Y.
110,748.—MACHINE FOR BENDING METAL STIRRUPS.—John H. De Valin, Baltimore, Md.
110,749.—WASHING-MACHINE.—Samuel De Veau, Syracuse, N.Y.
110,750.—GATE.—Albert Jason Dimick, Berlinville, Ohio.
110,751.—HANDLE FOR CROSS-CUT SAW.—Thomas S. Disston, Philadelphia, Pa., assignor to himself and Henry Disston & Son, same place.
110,752.—QUADRAT.—William Donald, Erie, Pa.
110,753.—FEED-WATER PIPE.—John Doyle, Baltimore, Md.
110,754.—TUG FOR TOWING BOATS.—Walter Everson, New York, N. Y.
110,755.—SPIKE-MACHINE.—David Eynon, Richmond, Va.
110,756.—SPIKE-MACHINE.—David Eynon, Richmond, Va., assignor to Tredegar Company, same place.
110,757.—FRUIT-CAN.—Reuben C. Farnham, Eldridge, N. Y., assignor of one-half his right to Russell B. Wheeler, same place.
110,758.—PLOW.—Nelson Faught, Pittsborough, Ind.
110,759.—EXCAVATOR.—David Gilmore and William W. Forrest, Petone, Ill., assignors to George Laidlow, same place.
110,760.—PRECAUTIONARY ATTACHMENT FOR BOTTLES CONTAINING POISON.—Joseph Harrison, Philadelphia, Pa.
110,761.—DEVICE FOR NICKING SCREW-CAPS.—William Hillhouse and George W. Briggs, New Haven, Conn., assignors to "The Grilley Company," same place.
110,762.—DEVICE FOR CUTTING SOLES FOR BOOTS AND SHOES.—Archealus M. Howe, Worcester, Mass.
110,763.—BROILER.—Michael T. Hynes, Boston, Mass.
110,764.—HOLLOW BRICK.—George H. Johnson, New York, N.Y.

110,765.—CARPENTERS' SHOOTING-BOARD.—Joseph Jones, Newark, N. J.
110,766.—CARRIAGE-AXLE.—Henry Killam, New Haven, Conn.
110,767.—EYELETTING-MACHINE.—Albert Komp, New York, N.Y.
110,768.—METALLIC HEEL.—Austin S. Mann, St. Louis, Mo.
110,769.—IRONING-TABLE.—Daniel W. Marshall, Pawtucket, R.I.
110,770.—FARE-RECORDER FOR CARS, &c.—George R. Metten, Cleveland, and Oscar S. Pease, Xenia, Ohio; said Metten assignor to said Pease.
110,771.—HORSE HAY-RAKE.—Charles Rollin Merriam, Middlebury, Vt., assignor to himself and W. H. Merriam, Stratford, N. H.
110,772.—CORN-HUSKER.—Abel Merwin, St. Josepn, Mich.
110,773.—METHOD OF FORMING BODY-LOOPS FOR CARRIAGES.—Robert R. Miller, Plantsville, Conn.
110,774.—COMPOUND FOR DESTROYING WORMS IN THE COTTON-PLANT.—Thomas W. Mitchell, Richmond, Texas, assignor to himself and Robert P. Briscoe, same place.
110,775.—STREET-SPRINKLER.—William C. Moores, Washington, D. C., assignor of two-thirds of his right to Gilbert Pullen, same place.
110,776.—CAR-COUPLING.—Joseph Mount, Monroe Township, N. J.
110,777.—MACHINE FOR CUTTING THE ENDS OF WOODEN PENCILS.—Telle H. Muller, New York, N. Y., assignor to Joseph Reckendorfer, same place.
110,778.—LIGHTNING-ROD.—David Munson, Indianapolis, Ind.
110,779.—CASTING CAR-WHEELS.—Chandler Needham, Worcester, Mass.
110,780.—CAR-STARTER.—William Harrison Newton, Newport, R. I.
110,781.—HEATING-STOVE AND DRUM.—William H. Nobles, St. Paul, Minn., assignor to himself and C. D. Williams, same place.
110,782.—HAIR-PUFF OR ROLL.—Joseph D. Oppenheimer, Philadelphia, Pa.
110,783.—FASTENING FOR BRACES, &c.—Edward Lawley Parker, Birmingham, England.
110,784.—MILK-HOUSE.—Henry Peregoy, Mount Carmel, Md.
110,785.—STEP-LADDER.—William G. Philips, Newport, Del.
110,786.—CORN-PLANTER.—Fielding W. Poe, Jr., Vandalia, Ill.
110,787.—WINDOW-SHADE.—Ansel W. Porter, Union City, Ind.
110,788.—CORN-PLANTER.—Jacob R. Randall, Camargo, Ill.
110,789.—WRENCH.—John F. Robertson, Warwick, N. Y., assignor of two thirds his right to James H. Holly and John G. Knapp, same place.
110,790.—MACHINE FOR SEWING OR WORKING BUTTON-HOLES.—Charles E. Robinson, Boston, Mass.
110,991.—FRAME FOR TRAVELING-BAGS, &c.—William Roemer, Newark, N. J.
110,792.—TARGET-GAME.—John C. Schooley, New York, N. Y.
110,793.—STEERING APPARATUS.—John C. Schrader and Carl L. Mathieson, New York, N. Y.
110,794.—STREET PAVEMENT.—William E. Shaw, Portland, Me.
110,795.—WARPING-MACHINE.—Thomas Singleton, Over Darwen, England.
110,796.—HYDRAULIC ENGINE.—William Snyder, Bullskin township, Pa.
110,797.—RAILWAY RAIL-CHAIR.—William H. Staats, Crescent,
110,798.—ENVELOPE.—Robert Sherwood Stubbs, Lisbon, N. H.
110,799.—MOWING-MACHINE.—Zuriel Swope, Lancaster, Pa.
110,800.—APPARATUS AND PROCESS OF CLEANING COTTON WASTE, &c.—George W. Sylvester, Belleville, N. J.
110,801.—MEAT-CHOPPER AND VEGETABLE-SLICER.—James M. Taft, Arcadia, Wis.
110,802.—CLOTHES-LINE HOLDER.—Ezra W, Talbott, Napoleon, Ohio, assignor to himself and James W. Miller, same place.
110,803.—RAILROAD-CAR VENTILATOR.—Clark P. Tillinghast, Providence, R. I.
110,804.—SODA WATER FOUNTAIN.—Antony Tumler, New York, N. Y.
110,805.—SCHOOL-DESK AND CHAIR.—Alexander Sidney Vaughan, Elkton, Md.
110,806.—APPARATUS AND PROCESS FOR DISTILLING OIL.—William G. Warden, Philadelpeia, Pa.
110,807.—COTTON-PLANTER.—Dwight F. Welsh, Nevada, Ohio.
110,808.—RAILWAY-SWITCH.—William Wharton, Jr. Philadelphia, Pa.
110,809.—BEE-HIVE.—John Wheeldon, Greensburg, Ind.
110,810.—ATTACHMENT FOR SEWING-MACHINES.—William H. White, Baltimore, Md., assignor of one-half his right to I. Wellington Hoyer, same place,
110,811.—CORN-PLANTER.—Joseph M. Whitmore and John N. Arvin, Valparaiso, Ind.
110,812.—MACHINE FOR WRAPPING "KISSES," &c.—Charles C. Wilson, Baltimore, Md.
110,813.—CUT-OFF VALVE FOR STEAM ENGINES.—George S. Young, Clearfield, Pa., assignor to himself and Al. Fitch Boynton, same place.
110,814.—MILL-SPINDLE STEP.—George S. Young, Clearfield, Pa., assignor to himself and Al. Fitch Boynton, same place.

REISSUES.

4,223.—CHILDREN'S CARRIAGE.—William E. Crandall, New York, N. Y.—Patent No. 100,121, dated February 22, 1870; reissue No. 3,972, dated May 17, 1870.
4,224.—SECURING RAILWAY-RAIL JOINT.—Lyman Fay, Worcester, Mass., assignor to Joseph M. Rice, same place, and Daniel R. Pratt, New York.—Patent No. 35,597, dated June 17, 1862.
4,225.—Division A.—INSTRUMENT FOR DRAUGHTING GARMENTS.—Ursula Louise Leete, New Haven, Conn.—Patent No. 105,068, dated September 6, 1870.
4,226.—Division B.—INSTRUMENT FOR DRAUGHTING GARMENTS.—Ursula Louise Leete, New Haven, Conn.—Patent No. 107,068, dated September 6, 1870.
4,227.—CLOTHES-WASHER.—Ariadna B. Mercier, Providence, R. I.—Patent No. 56,773, dated July 31, 1866.
4,228.—PUNCH.—Isaac P. Richards, Whitinsville, Mass.—Patent No. 104,769, dated June 28, 1870.
4,229.—BLANK FOR, AND DIE FOR MAKING, MOLK-BOARDS FOR PLOWS.—William Medd Watson, Tonica, Ill.—Patent No. 109,825, dated March 15, 1870.

DESIGNS.

4,547.—CARPET-PATTERN.—Robert R. Campbell, Lowell, Mass., assignor to Lowell Manufacturing Company, same place.
4,548.—CARPET-PATTERN.—Robert R. Campbell, Lowell, Mass., assignor to Lowell Manufacturing Company, same place.
4,549.—CARPET-PATTERN.—Robert R. Campbell, Lowell, Mass., assignor to Lowell Manufacturing Company, same place.
4,550.—CARPET-PATTERN.—Robert R. Campbell, Lowell, Mass., assignor to Lowell Manufacturing Company, same place.
4,551.—HAIR-PIN.—William F. Fluhrer, New York, N. Y.
4,552.—TYPE.—Julius Herriet, New York, N. Y., assignor to David Wolfe Bruce, same place.
4,553.—TYPE.—Julius Herriet, New York, N. Y., assignor to David Wolfe Bruce, same place.
4,554.—EGG-STEAMER.—William Kirkham, Springfield, Mass.
4,555.—SHAWL.—Charles H. Landenberger, Philadelphia, Pa.
4,556.—RAILING FOR CEMETERY LOTS.—Albert Laurence Murphy, Philadelphia, Pa.
4,557.—LAND-MARK.—John H. Parrish, Greensborough, Ala.
4,558. COLLAR-BOX COVER. Pulaski B. Pickens, New York, N. Y.
4,559.—TYPE.—Richard Smith, Philadelphia, Pa., assignor to MacKellar, Smiths & Jordan, same place.
4,560.—TYPE.—Richard Smith, Philadelphia, Pa., assignor to MacKellar, Smiths & Jordan, same place.
4,561.—TYPE.—Bichard Smith, Philadelphia, Pa., assignor to MacKellar, Smiths & Jordan, same place.
4,562.—CHAIN-HOOK.—George D. Stevens, New York, N. Y.

TRADE MARKS.

122.—DURHAM TOBACCO.—W. T. Blackwell, Durham, N. C.
123.—AGRICULTURAL IMPLEMENT.—Hall & Speer, Pittsburg, Pa.
124.—HAY-ELEVATOR AND OTHER AGRICULTURAL IMPLEMENTS.—Aaron J. Nellis, Pittsburg, Pa.
125.—SEA-MOSS COUGH-CANDY, TROCHES, AND SIRUP.—William J. Rand, Jr., Brooklyn, N. Y.
126.—YEAST.—The National Yeast Company, Seneca Falls, N. Y.

The Importation of Iron into this Country seen from an English Standpoint.

WE hear so much on this subject from our own press that the following from the English *Colliery Guardian* will be read with interest.

Early this year we called attention to the enormous consumption of iron, and especially railway iron, in the United States. This consumption is still proceeding on a vast scale, and the United States have now become our best foreign customer for railway iron, having pushed Russia and India comparatively into the background. In October, for instance, we sent to the United States 28,219 tons of railway iron, as compared with 18,743 tons in October, 1869, and 18,723 tons in October, 1868. Again, in the first ten months of this year we exported railway iron to the United States to the extent of 341,629 tons, against 262,829 tons in the corresponding ten months of 1869, and 228,091 tons in the corresponding ten months of 1868. The increase in the exports to October 31, this year, was thus no less than 78,800 tons, comparing 1870 with 1869, and 114,538 tons comparing 1870 with 1868. The increase in the demand for our railway iron among the Americans has thus been even greater this year than in 1869; and the extent of our commercial relations with the United States, in the matter of railway iron, may be gathered from the fact that of the whole exports of British railway iron made to October 31, this year, 36 per cent., or something over one-third, went to the United States.

Yet the Americans appear to be making great efforts to render themselves independent of foreign countries in the matter of iron. A report, drawn up by the Secretary of the American Iron and Steel Association, shows a wonderful expansion in the iron trade of the Republic. Several of the Western States, which a few years since were dependent upon other sources for their pig iron, now practically meet their own wants in that particular. The total production of anthracite pig iron in the United States stood in 1860 at 519,211 tons; in 1869 it had risen to 971,150 tons. The production of bituminous coal furnaces appears to have increased with equal rapidity; it amounted in 1869 to 553,341 tons, showing an increase of 63 per cent. over the production of 1868, of 74 per cent. over that of 1867, and of 105 per cent. over that of 1866. While the production last year stood at 553,341 tons, it amounted in 1854 to only 54,485 tons; and in the fifteen years ending with 1869 inclusive the annual average increase in the make was 54½ per cent. The production of charcoal-made pig in 1869, in the United States, was 392,150 tons, viz., 38,000 in the New England States, 134,000 tons in the Middle States, 206,500 tons in the Western States, and 13,650 tons in the Southern States. In the last-named States a number of old charcoal furnaces, which were out of blast when the war ended, have recently been repaired and relighted. Three of these relighted furnaces are in Alabama—a State which is making a great effort to develop her mineral resources. The total production of pig iron of all kinds in the United States last year was 1,916,641 tons, and the strides which the production is making are reflected in the fact that it has been more than donbled in four years.

All this is interesting enough, but we must pass on and see what America is doing in making railway iron to supply the wants of her ever-expending railway network. Well, in 1861, American railway iron was made to the extent of 189,818 tons; in 1869, the total had risen to 593,586 tons. But even then, the Americans had in 1869 to import 345,000 tons, making, with the 593,586 tons manufactured by themselves, a total consumption of 938,586 tons; and, taking into consideration the growth of the American railway system, the railway iron requirements of the Republic for the next five years are expected to average upwards of 1,000,000 tons per annum. The production of American rolling mills besides rails, in 1869, was 642,420 tons, comprising 292,500 tons of bar and rod iron, 36,820 tons of sheet iron, 68,000 tons of plates, 17,200 tons of hoop iron, 146,400 tons of spikes and nails, and 72,000 tons of axles, etc. Of the same descriptions of iron, the United States imported 120,795 tons, making a total consumption of rolled iron other than rails, in 1869, of 763,215 tons. Notwithstanding the substantial progress which the American iron trade is making, the United States thus still continue to draw large supplies from Great Britain, the shipments thence to the Union of all descriptions of iron reaching an aggregate of 596,554 tons. Of this quantity, 300,446 tons consisted of rails, so that, after all, the work of railway construction and maintenance among the Americans is the great cause and mainstay of their large consumption of our iron.

Will this large consumption continue? We think it will, because, however strenuous the exertions of the Americans may be to develop the resources, and to stimulate the production, of their own metallurgical interest, there never was a time in which so much activity was displayed in the Republic in the work of railway construction. In California, for instance, three or four great lines are now being built, and there is scarcely a State in which kindred projects are not on hand. A rumor comes to hand from San Francisco that a grand consolidation is about to be formed between the Pacific Railroad and its Eastern connections, on the one hand, and China and Australian steamship lines on the other hand, with a view to the control and development of the commerce of the Pacific Ocean. For this purpose a new company is to be formed, embracing the stockholders of both the railroad and steamboat companies, and it will be placed under the official management of several well-known English and American capitalists. But if this enterprise aims at the creation of anything approaching a monopoly, it is not likely to come to much, it is rather likely to develop new competitions. The railway and the steamship seem likely to absorb and to create more and more American capital, and it is impossible to assign any limits to the demand for iron in the United States.

BUSINESS AND PERSONAL.

[*Short notices in this column fifty cents per line each insertion.*]

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CHARLES ROGERS, Solicitor and Manager.

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A COMPLETE PATENT AGENCY,

and now offer our services in procuring patents in this and foreign countries, and transacting all business relating to the obtainmg of patents.

Being possessed of superior facilities, in connection with our associate attorneys in Washington and foreign countries, for the successful prosecution of this business, we do not hesitate to guarantee satisfaction to all who may entrust their business to our care.

We have engaged as solicitor and manager Mr. CHARLES ROGERS, a well-known expert in this department. Being a practical mechanic, and having been an examiner in the Patent Office at Washington for a number of years, besides enjoying an experience of more than twenty years as a solicitor of patents, Mr. ROGERS is intimately acquainted with all the details of the business, both in and out of the office.

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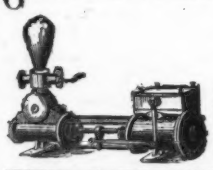

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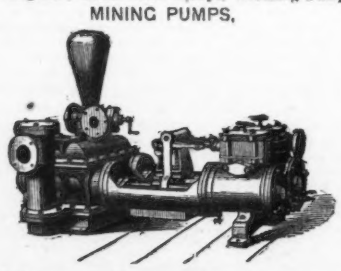

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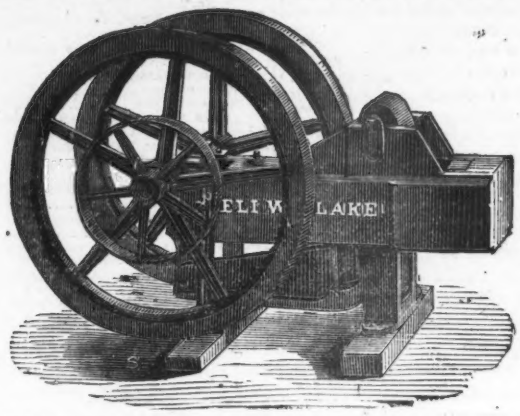

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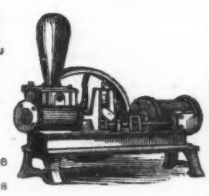

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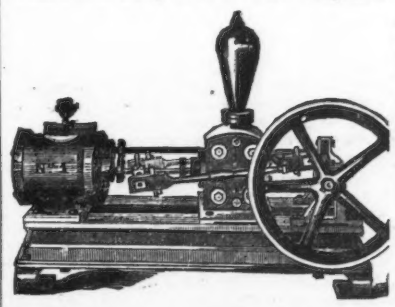

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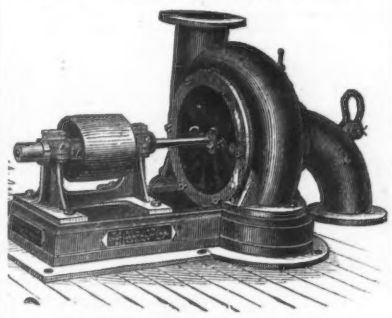

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Our Plan for 1871

IS

CAPITAL WITHOUT STINT

For these purposes, and

MAGNIFICENT PAY

To all who help us.

We desire to pay out the coming year not less than a Quarter of a Million of Dollars from our receipts and reserves, for the services of Volunteer Agents alone, in all the States, Territories, and Provinces of North America. Our paper challenges comparison with the best Journals of Arts and Engineering in the world. It is at the same time one of the cheapest publications ever issued from the press; and to all its attractions we now add a range of Premiums tantamount almost to a free gift of our paper, our labor, our earnings, for the year, for the sake of introducing THE MANUFACTURER AND BUILDER to myriads of readers, whose patronage in future years will recompense our present lavish outlay.

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In the following table is given the price of each article, and the number of subscribers required to get it free, at $1 50 a year; also at the club rate of $1 a year. The descriptions of a few articles are given in the fourth column, the balance is given in our *Descriptive Premium Sheet*, which will be sent on application to those who contemplate getting up clubs.

List of Premiums and Terms for Vol. III., 1871.

A Free Field for Everybody. No Competition.

No.	Names of Premium Articles.	Price of Premiums.	Number of Subscribers required at $1 50	Number of Subscribers required at $1
	FROM PATTERSON & BROS.			
1	Tool Chest	$45 00	60	190
2	Case Mathematical Instruments	9 00	18	55
3	Case Mathematical Instruments	15 00	22	75
4	Pocket Knife	1 50	4	21
5	Pocket Knife	2 00	5	22
6	Pocket Knife	2 50	6	25
7	Lady's Pocket Knife	2 00	5	22
8	One dozen Knives and Forks	14 00	21	70
9	One dozen Knives and Forks	18 50	27	90
10	One dozen Knives and Forks	22 00	33	110
11	One dozen Knives and Forks	25 50	39	124
12	Carver and Fork	5 00	13	37
13	Fluted Sharpening Steel	2 50	6	25
	FROM HALL, ELTON & CO.'S PLATE.			
14	One dozen Tea-spoons, medallion	5 75	14	40
15	One dozen Table-spoons, medallion	12 00	19	65
16	One dozen Table Forks, medallion	12 00	19	65
17	Butter-Knife, medallion, solid	1 00	4	
18	Soup-Ladle, medallion	5 75	14	40
19	Ice or Water-Pitcher, No. 3	17 00	26	80
20	Pocket Fruit-Knife, No. 12	2 00	5	22
21	Revolving Butter-Cooler, No. 80.	8 00	16	52
22	Cake-Basket, No. 1867	10 00	18	58
23	Caster, 6 bottles, chased, No. 2039	9 25	18	54
24	Fruit-Basket, No. 200	13 50	21	75
25	Child's Cup, No. 041	2 75	6	25
26	Knife, Fork, and Spoon, child's set, morocco case	3 00	8	30
27	One dozen Napkin-Rings, medallion	9 00	17	54
28	Tea Set, gold lined, No. 1822	48 00	52	180
29	Tea Set, No. 1866	36 00	45	135
	FROM COLBY BROS. & CO.			
30	Knife-Cleaner	75	2	
	FROM MABIE, TODD & CO.			
31	Gold Pen and Pencil, rubber case	8 00	15	45
32	Gold Pen and Pencil, rubber case	6 75	13	37
33	Gold Pen, silver or gold holder, in box	4 25	9	32
34	Gold Pen, extension gold case, in box	29 00	29	90
35	Lady's Gold Pen, ivory holder, in box	2 75	6	25
	FROM HENRY RUSSELL & CO.			
36	Downer Mineral Oil Lamp, No. 1956	4 75	10	35
37	Downer Mineral Oil Lamp, No. 1963	9 25	17	56
	FROM C. F. A. HEINRICH.			
38	St. Germain Student Lamp, largest size	8 25	15	45
	FROM FAIRBANKS & CO.			
39	Family Scales	14 00	21	70
	FROM COLBY BROS. & CO.			
40	Clothes-Wringer	7 50	10	35
	FROM ALEXANDER M. LESLEY.			
41	Refrigerator, the Zero, No. 38	38 00	42	142
42	Cooler, the Newport, No. 1	12 00	15	45
43	Hot-Air Coal Furnace, the Gothic, No. 9	125 00	135	450
44	Hot-Air Wood Furnace, Gothic, No. 10	150 00	162	525
	FROM THE STANLEY RULE & LEVEL CO.			
45	Iron Smoothing-Plane, Bailey's patent	5 00	13	37
46	Iron Smoothing-Plane, Bailey's patent	6 50	14	42
47	Iron Jack-Plane, Bailey's patent	7 50	15	47
48	Iron Fore-Plane, Bailey's patent	9 00	17	55
49	Iron Jointer-Plane, Bailey's patent	10 00	18	58
50	Wood Smoothing-Plane, Bailey's patent	3 00	8	30
51	Wood Fore-plane, Bailey's patent	4 50	10	35
52	Wood Jointer-Plane, Bailey's patent	4 75	12	36
53	Wood Jointer-Plane, Bailey's patent	5 50	14	40
	FROM POST & GODDARD.			
54	Machinists' Hand-Taps	17 60	25	75
55	Machinists' Hand-Taps	52 80	65	220
56	Machinists' Hand-Taps (your choice)			
57	Screw-Plates and Dies, size A	5 00	12	37
58	Screw-Plates and Dies, size B 1	8 00	15	45
59	Screw-Plates and Dies, size C 1	10 00	18	58
60	Screw-Plates and Dies, size D 1	13 00	20	70
61	Tap-Wrenches, size A	3 00	7	25
62	Tap-Wrenches, size B	4 00	9	30
63	Tap-Wrenches, size C	5 00	12	37
64	Set of 11 Taper Shank-Twist Drills, No. 1	19 75	29	90
65	Set of 29 Drills, straight shank, mounted, No. 9	12 00	18	60
66	Set of 50 Drills, steel wire gauge from 1 to 60, No. 12	8 00	15	45
67	Set of 21 Taper-Shank Drills, No. 3	44 00	58	175
68	Set of 9 Bit-Stock Drills, 1-16 to 3 8 in	2 80	6	25
69	Self-Centering Drill-Chucks, Beach's patent, for jewelers, No. 0	10 00	18	58
70	Self-Centering Drill-Chucks, Beach's patent, for drilling, No. 0	7 00	14	40
71	Self-Centering Drill-Chucks, Beach's patent, 0 to 3-16, No. 1	6 00	13	38
72	Self-Centering Drill-Chucks, Beach's patent, 1 to 60 S. W. E., No. IX	7 00	14	40
73	Self-Centering Drill-Chucks, Beach's patent, 0 to ¼, No. 3.	14 00	23	77
74	Drill-Grinding Machine, No. 1	10 00	18	58
75	Drill-Grinding Machine, No. 2	20 00	30	95
76	Auger-Bits, your choice of 4 sets	—	—	—
	FROM L. W. POND.			
77	Foot-Lathe, No. 1	50 00	65	204
78	Foot-Lathe, No. 2	30 90	47	124
	FROM COLBY BROS. & CO.			
79	Miniature Steam-Engine and Boiler	1 36	5	23
	FROM RUSSELL & SPEIR.			
80	Steam-Engine (1 H. P.) and Boiler	300 00	310	1125
81	Steam-Engine (3 H. P.) and Boiler	600 00	640	2250
82	Steam-Engine (5 H. P.) and Boiler	800 00	858	3000
83	Steam-Engine (10 H. P.) and Boiler	1200 00	1285	4500
84	Steam-Pump, C. B. Hardick's, No. 0	120 00	155	540
85	Steam-Pump, Cameron & Co.'s, No. 1	150 00	192	675
86	Steam-Pump, Cameron & Co.'s, No. 2	200 00	257	900
87	American Submerged Pump	12 00	19	65
	FROM GEORGE TALLCOT.			
88	Turbine Water-Wheel, Reynold's, 12 in	105 00	125	360
89	Turbine Water-Wheel, Reynold's, 24 in	226 50	270	800
90	Turbine Water-Wheel, Reynold's, 36 in	384 50	460	1350
91	Rotary Blower, Root's patent No. 1	$52 60	70	275
92	Rotary Blower, Root's patent, No. 2	80 00	105	420
93	Portable Forge, Root's patent, No. 1	48 00	65	260
94	Portable Forge, Root's patent, No. 3	80 00	105	420
	FROM THE AMERICAN SAW CO.			
95	Circular Saw	125 00	135	473
96	Cross-Cut Saw	6 00	14	42
	FROM A. P. & M. STEPHENS.			
97	Labor-Saving Vise, 2-in. jaw	4 00	9	32
98	Labor-Saving Vise, 4½-in. jaw	12 00	28	58
	FROM THE STANLEY RULE & LEVEL CO.			
99	Boxwood two-foot Rule	2 50	6	25
100	Silver-Plated Triangular Drawing-Scale	6 00	16	52
101	Pocket Sheet-Metal Gauge	5 00	13	37
102	Arkansas Oil-Stone	1 75	5	22
103	Arkansas Oil-Stone, mahogany case	3 25	8	30
104	Gear or Cog-Wheel Calculating-Rule	4 00	12	36
	WESTERN & COMPANY'S AGENCY.			
105	Preparing and Filing a Caveat	25 00	28	80
106	Application for a Patent	30to40	35	100
107	Application for Patent and first Government fee	46to56	50	150
108	Application for Patent and all Government fees	66to76	75	250
	FROM J. W. HUTCHINSON.			
109	English Breech-loading double-barrel Gun	100 00	110	350
110	English Muzzle-loading double-barrel Gun	75 00	85	250
111	Breech-loading Rifle, the Allen	30 00	46	150
112	Revolver, Smith & Wesson's, No. 1½	12 50	19	65
113	Revolver, Smith & Wesson's, No. 2	15 00	22	75
	FROM MASON & HAMLIN.			
114	Melodeon, portable, No. 1, 4 octave	50 00	66	200
115	Melodeon, resonant, style G, 5 octave	170 00	146	510
116	Pipe-Organ, church use, style No. 29	675 00	579	2000
	FROM J. S. & C. ODELL.			
117	Pipe-Organ,	500 00	430	1500
118	Pipe-Organ	700 00	600	2100
119	Bradbury Square Piano-Forte, No. 4	650 00	430	1500
120	Steinway's No. 1 Grand Piano	1200 00	860	3000
	THE AMERICAN WATCH CO., WALTHAM, MASS.			
121	Silver Watch	20 00	32	100
122	Silver Watch	35 50	48	142
123	Gold Watch	50 00	65	200
124	Lady's Gold Watch	100 00	110	350
	FROM THE UNITED STATES WATCH CO.			
125	Silver Watch	40 00	50	150
126	Silver Watch	66 00	75	275
127	Gold Watch	100 00	100	300
128	Silver Watch	104 00	104	312
129	A Sewing Machine (your choice)	65 00	65	200
	FROM MCALLISTER.			
130	Microscope and 48 objects	10 00	14	40
	FROM COLBY BROS. & CO.			
131	Velocipede for Boys	16 00	16	52
	FROM MCALLISTER.			
132	Magic-Lantern, No. 433	20 00	30	95
	FROM H THOMPSON.			
133	An Easy Chair			
	FROM D. APPLETON & CO.			
134	New American Cyclopædia, 16 vols	80 00	80	213
	FROM G. & C. MERRIAM.			
135	Webster's Unabridged Pictorial Dictionary	12 00	15	45
136	Webster's National Pictorial Dictionary	6 00	10	35
	FROM WESTEN & COMPANY.			
137	One back vol. Manufacturer and Builder, unbound, post-paid	1 75	6	25
138	Two back volumes Manufacturer and Builder, unbound, post-paid	3 50	11	37
139	One back vol. Manufacturer and Builder, bound, post-paid	2 50	9	32
140	Two back volumes Manufacturer and Builder, bound, post-paid	5 00	18	58
141	Cover for binding the Manufacturer and Builder, post-paid	60	3	21
142	A $10 Library (your choice from list in special sheet),	10 00	18	58
143	A $ 5 Library, "	15 00	24	85
144	A $20 Library, "	20 00	31	106
145	A $25 Library, "	25 00	38	125
146	A $30 Library, "	30 00	44	144
147	A $35 Library, "	35 00	50	162
148	A $40 Library, "	40 00	56	177
149	A $45 Library, "	45 00	62	192
150	A $50 Library, "	50 00	68	207
151	A $60 Library, "	60 00	80	237
152	A $75 Library, "	75 00	100	282
153	A $100 Library, "	100 00	125	360

All paid through by mail or express.

154	A choice of good Books (see terms in another column)			
155	A choice of convenient Book-Cases (see special sheet)			
156	A choice of popular Music (see terms in special sheet)			
157	A choice of Games and Toys, (see terms in special sheet)			

We have taken especial pains to select in making up our price list the NEWEST and very BEST articles. No charge will be made for boxing or packing any article on our list. The Premiums, Nos **4** to **7** inclusive, **31** to **35** inclusive, **79**, **99**, **101**, **105** to **108** inclusive, **121** to **128** inclusive, **137** to **141** inclusive, **154**, **156**, **157**, will each be delivered FREE of charge by mail or express (at the Post-office or express office nearest recipient) to any place in the United States or Territories. The other articles cost the recipient only the freight after leaving the manufactory of each, by any conveyance specified.

As an aid to those who engage upon large clubs, we will count subscriptions by *one* individual for 1869, 1870, and 1871, as *three* subscribers toward a premium. Every *new* subscriber should have the work upon the beginning. Bound volumes may be counted in the same way—each as one subscriber—except, of course, when they are obtained as a premium.

Do not fail to note the following Points:

1. All subscribers sent by one person count, though from one or a dozen different post-offices. But

2. State with each name or list of names sent that it is for a premium.

3 Send the names as fast as obtained, that the subscribers may begin to receive the paper at once. You can have any time, from one to six months, to fill up your list.

4. Send the exact money with each list of names, so that there may be no confusion of money accounts.

5. Old and new subscribers all count in premium clubs, but a portion, at least, should be new names; it is partly to get these that we offer premiums to canvassers.

N.B. –The extra copy to clubs of ten or twenty is not given where premium articles are called for.

6. Specimen numbers, cards, and show-bills will be supplied free, as needed by canvassers; but they should be used carefully and economically, as they are very costly.

7. Remit money in Checks on New York banks or bankers, payable to order of WESTERN & COMPANY, or send Post-Office Money Orders. If neither of these is obtainable, Register Money Letters, affixing stamps both for the postage and registry; put in the money and seal the letter in the presence of the postmaster, and take his receipt for it. Money sent in any of the above ways is at our risk.

DESCRIPTIVE LIST OF PREMIUMS.

Every Premium in the annexed list is described in the December MANUFACTURER AND BUILDER, *and also in a* **Special Descriptive Sheet,** *which will be sent* **free** *to every one desiring it. We have room here for the following only:*

Nos. 105 to 108—To Procure a Patent without Money.—We have met with many having valuable inventions, which inventors are anxious to get patented, but are unable to afford the expense, and consequently fail to secure the profits which a patent might produce To such as are in this position, we make the following liberal offer: No. **108**—We will prepare an application for a patent, attend to its passage through the Patent Office, and pay all government fees and incidental expenses attending the same, for any inventor presenting a patentable invention, who will get up a club of seventy-five subscribers for THE MANUFACTURER AND BUILDER for one year at $1,50 each, or 250 at $1 each, and send us the money by post-office order. If this application should be rejected, they may send us an additional list of thirty subscribers at $1.50 each, and the subscription money for the same, on receipt of which we will prepare and prosecute a second application, paying all government fees and incidental expenses. No. **107**—For a list of fifty subscribers at $1.50 each, or 150 at $1 each, with the cash accompanying it, we will prepare an application, attend to its passage through the office, and pay the government fee ($15), the applicant paying the second government fee of $20. No. **106**—For a list of thirty-five subscribers at $1.50, sent in the same way, we will prepare and prosecute an application, the applicant paying the government fee. No. **105**—for twenty-eight subscribers at $1.50 each, or eighty at $1 each, we will prepare and file a caveat, furnish the necessary drawings, (which we also furnish in all the above cases), and pay all government fees. All cases placed in our hands under these arrangements will receive our best attention, equally with those for which our fees have been paid in cash, and will be appealed to the Board of Examiners-in-Chief if necessary, the applicant paying the government fee of $10 on such appeal. If the inventor has no model to accompany his application, he may procure additional subscribers, the premium on which (see cash rates) will enable him to pay for the model. A club of 100 names has been obtained in a single establishment where from 150 to 200 hands are employed. A village of 500 inhabitants will take this number readily.

No. 129—Sewing Machines.—Your choice! A $65 machine for 65 subscribers, at $1.50 each.—It makes no difference to us which machine we send, or whether it is selected at first or at the last moment. No charge for boxing the machines; they go safely as freight. For circulars, giving full particulars in regard to style of machines, fixtures, etc., as well as instructions, send to **Grover & Baker Manufacturing Co.,** 495 Broadway, New York; **Florence Sewing Machine Co.,** 505 Broadway, New York; **Wilcox & Gibbs Sewing Machine Co.,** 658 Broadway, New York; **Singer Sewing Machine Co.,** 458 Broadway, New York.

Nos. 137, 138—Volumes of the Manufacturer and Builder.—The unbound volumes of THE MANUFACTURER AND BUILDER consist of a set of numbers for a year, each separate in its own paper cover. These volumes amount to a valuable Library on all matters pertaining to the Industrial Arts, and contain more varied information on manufacturing building, and mechanical subjects than can be obtained in books costing three times as much. The price of the volumes unbound is $1.50 each, at the office, or $1.75 if sent by mail, as they must be post-paid. They are profusely illustrated, the engravings used in them having alone cost thousands of dollars. For ordinary use, the sets of numbers unbound will answer quite well.

Nos. 139, 140—Bound Volumes of the Manufacturer and Builder.—*New* subscribers almost invariably desire to secure the back numbers of THE MANUFACTURER AND BUILDER from its commencement. Some desire them bound in our uniform style, while others prefer to get the loose numbers and have them bound to suit their own tastes. *Our* binding is very neat, and being done in large quantities at one time, is furnished at a *very cheap* rate. It is moreover very handsome, being of cloth, with gilt title and back, sides embossed and ornamented with a neat architectural device stamped in gold. The price of the volumes is $2.50 each, sent post-paid.

No. 141—Covers for Binding the Manufacturer and Builder.—These are described in premium 139, 140. Now ready for 1869 and 1870. Be careful to state *which year* you require. Any country binder will insert the year's numbers in one of these covers at a moderate cost. Price, 50 cents; sent, *post-paid,* on receipt of three subscribers at $1,50 for each cover.

Nos. 142 to 154—Good Libraries.—In these premiums we offer a choice of books for manufacturers, mechanics, artisans, builders and others. The person entitled to any one of the premiums 142 to 153, may select any books desired from the list published in our Special Premium Sheet, to the amount of the premiums, and the books will be forwarded, post or express paid. $25 or $50 worth of books pertaining to the industrial arts will give the boys new ideas, set them to thinking and observing, and thus enable them to make their heads help their hands. Any good book will, in the end, be of far more value to a youth than to have an extra hundred dollars on coming to manhood. ☞ Let the mechanics of a neighborhood unite their efforts, and through these premiums get an industrial library for general use.

No. 154—General Book Premium.—Any one sending twenty-five or more names may select books from our list to the amount of ten cents for each subscriber sent at $1; or thirty cents for each name sent at $1.20; or sixty cents for each name at $1.50. *This offer is only for clubs of twenty-five or more. The books will be sent by mail or express, prepaid through by us.*

SPECIMEN COPIES, CIRCULARS, SHOW-BILLS, etc.,

will be furnished free of charge in sufficient quantities to meet the reasonable requirements of agents. We would respectfully request that they do not waste them, but distribute them judiciously. If some unexpected event should prevent them from continuing in the business, they will do the square thing by us by giving their outfit to some friend, who will continue the business where they have left off; and who will no doubt be grateful for the opportunity of receiving profitable employment.

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Every subscriber pays his own postage at the office where he receives the paper. This is only twenty-four cents per year, or six cents per quarter, payable in advance.

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until everybody has been supplied with a circular and has had a chance to subscribe; and be sure that you

PUBLICATIONS.

leave your address, so that they may know where to find you in case they should make up their minds to take the magazine after you have left them. Make all drafts, money-orders, and registered letters payable to the order of Western & Company, publishers, and address all communications

WESTERN & COMPANY, Publishers,
NO. 37 PARK ROW, NEW YORK.

TABLE OF CASH PREMIUMS For 1871.

EVERY MAN HIS OWN PAY-MASTER. STEADY EMPLOYMENT AND GOOD PAY.	PREMIUMS. At $1 50 each.	PRE'S. At $1 00 each
For every club of 4 subscribers.....	$1 00	
" " " 10 "	3 00	
" " " 15 "	6 00	
" " " 20 "	10 00	
" " " 30 "	16 50	$1 50
" " " 40 "	24 00	4 00
" " " 50 "	32 50	7 50
" " " 75 "	48 75	11 25
" " " 100 "	65 00	15 00
" " " 200 "	140 00	40 00
" " " 500 "	350 00	100 00
" " " 1000 "	700 00	200 00

INTERMEDIATE CLUBS.

It often happens that clubs are made up of numbers that are not found in the above table. Names may be added to clubs at the following rates :

In clubs of	4	and less than	10..	$1 25	for each name.
" "	10	" "	15..	1 20	" "
" "	15	" "	20..	1 10	" "
" "	20	" "	30..	1 00	" "
" "	30	" "	40..	95	" "
" "	40	" "	50..	90	" "
" "	50	" "	200..	85	" "
" "	200	" "	500..	80	" "
" "	500	" "	1000..	80	" "
" "	1000	and over.....		80	" "

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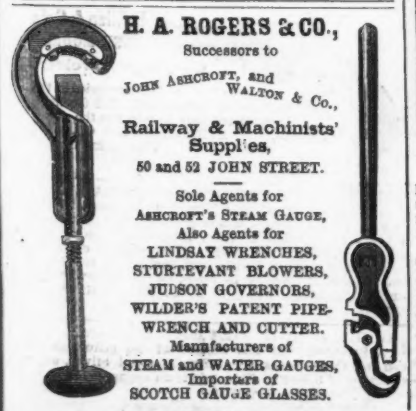

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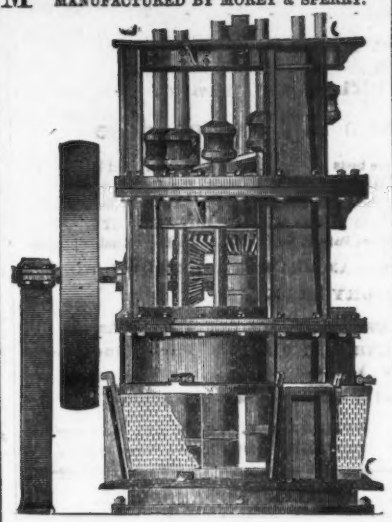

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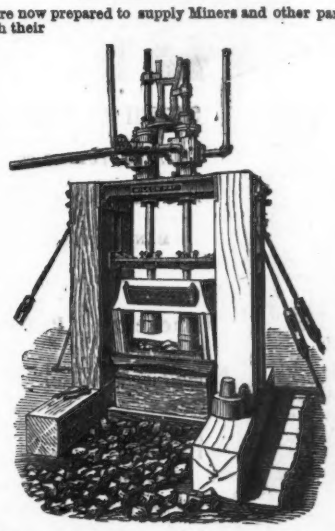

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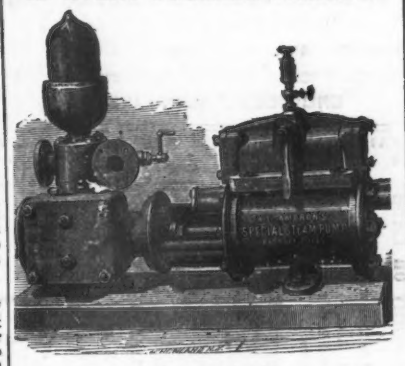

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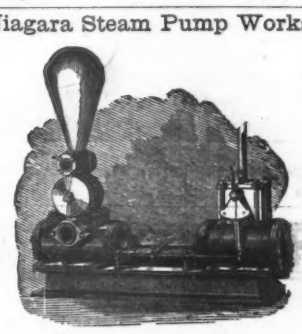

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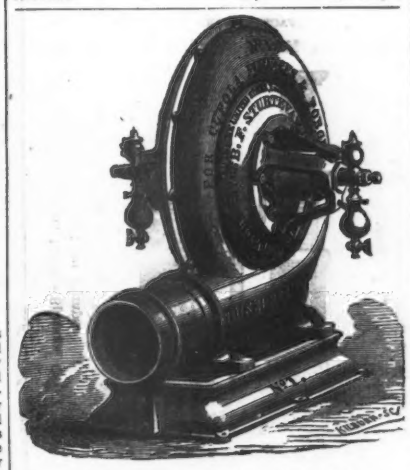

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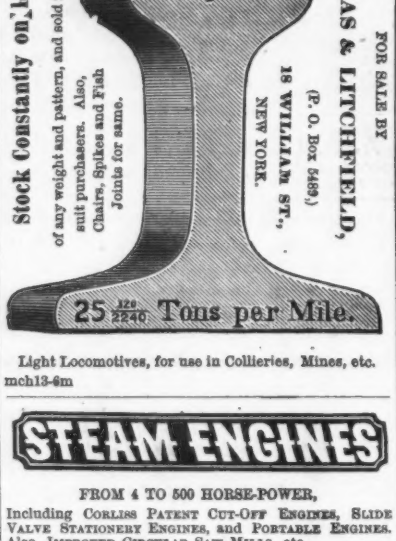
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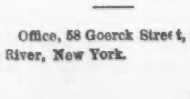

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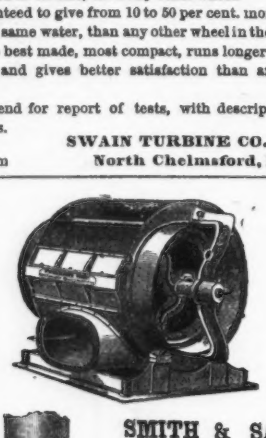

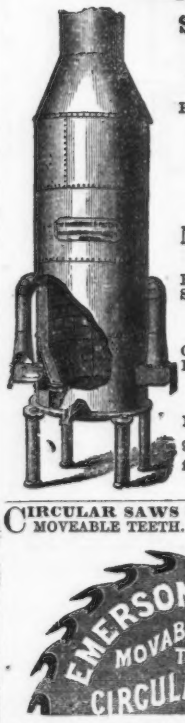

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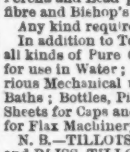

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